MONTHLY WEATHER REVIEW.

Editor: Prof. Cleveland Abbe.

Vol. XXV. MAY, 1897. No. 5

INTRODUCTION.

The Monthly Weather Review for May, 1897, is based on 2,927 reports from stations occupied by regular and voluntary observers, classified as follows: 143 from Weather Bureau stations; numerous special river stations; 33 from post surgeons, received through the Surgeon General, U. S. Army; 2,588 from voluntary observers; 96 received through the Southern Pacific Railway Company; 14 from Life-Saving stations, received through the Superintendent United States Life-Saving Service; 32 from Canadian stations; 1 from Hawaii; 20 from Mexican stations. International simultaneous observations are received from a few stations and used together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Government Survey, Honolulu; Dr. Mariano Bárcena, Director of the Central Meteorological Observatory of Mexico and Commander J. E. Craig, Hydrographer, United States Navy.

The Review is prepared under the general editorial supervision of Prof. Cleveland Abbe. Unless otherwise specifically noted, the text is written by the Editor, but the meteorological tables contained in the last section are furnished by Mr. A. J. Henry, Chief of the Division of Records and Meteorological Data.

CLIMATOLOGY OF THE MONTH.

GENERAL CHARACTERISTICS.

The month was remarkable for the unprecedented flood in the lower portion of the Mississippi River, which had, however, begun to decline at the close of the month. The rainfall in the upper watershed of the Rio Grande was remarkably heavy, thus preparing for the subsequent floods in the lower part of the river. The mean temperatures were the highest on record at several stations in the northern Plateau and north Pacific Slope and California. It was the lowest on record at several stations in Indiana, Ohio, Kentucky, and Tennessee.

ATMOSPHERIC PRESSURE.

[In inches and hundredths.]

The distribution of mean atmospheric pressure reduced to sea level, as shown by mercurial barometers, not reduced to standard gravity, and as determined from observations taken daily at 8 a. m. and 8 p. m. (seventy-fifth meridian time), is shown by isobars on Chart IV. That portion of the reduction to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border.

The *mean pressure* during the current month was highest off the coast of Washington and Oregon; it was lowest in Arizona, and low in eastern Montana.

The highest reduced pressures were: In the United States, Tatoosh Island, 30.10; Fort Canby and Eureka, 30.07; Seattle, Des Moines, Kansas City, St. Louis, Knoxville, Chattanooga, New Orleans, Mobile, Pensacola, and Charleston, 30.06. In Canada, Bermuda, 30.14; Halifax, 30.05; Sydney, 30.04. The lowest were: In the United States, Yuma, 29.76; Phœnix, 29.77; Fresno, 29.86; Havre, 29.88; Miles City, 29.89. In Canada, Prince Albert, 29.83; Edmonton, Swift Current, and Rockliffe, 29.92.

As compared with the normal for May, the mean pressure was generally in excess, except slight deficiencies in Oregon California, and the Lake Region.

The greatest excesses were: In the United States, Wichita, 0.13; Oklahoma, Kansas City, and Des Moines, 0.12; Bismarck, St. Louis, Dodge City, Amarillo, and Abilene, 0.10. In Canada, Bermuda and Halifax, 0.08; Sydney, Minnedosa, and Calgary, 0.07. The deficits were: In the United States, Yuma, 0.08; Oswego, 0.05; Portland, Oreg., Roseburg, and Fresno, 0.04. In Canada, Rockliffe, Kingston, and Toronto, 0.02.

As compared with the preceding month of April, the pressures reduced to sea level show a slight rise in Iowa and Missouri, Cape Breton, and Newfoundland, but a fall in all other regions.

The greatest rises were: In the United States, Omaha, 0.03; Des Moines, Kansas City, and Wichita, 0.02. In Canada, St. Johns, N. F., 0.07; Sydney, 0.03. The greatest falls were: In the United States, Salt Lake City, 0.18; Fresno, 0.16; Idaho Falls, Winnemucca, and Red Bluff, 0.15; Carson City, Harrisburg, New York, Atlantic City, and Hatteras, 0.14. In Canada, Kingston, 0.12; Ottawa, Rockliffe, Parry Sound, Toronto, Saugeen, 0.11.

AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. Hazen.

During the month the apparent paths of seven highs and eleven lows were sufficiently well defined to be traced on the accompanying charts, I and II. The following table gives the principal facts regarding the origin, movement, and point of disappearance of these highs and lows.

The following general remarks are added: The highs and lows of the month have been remarkably well defined for this season of the year. The general transference has been quite uniform, except when starting in the Pacific or north of Montana.

HIGHS.

Numbers I and II began in the Lake Superior region, moved a little south of east, and were last seen on or near the south Atlantic Coast. VII began to the north of Montana, and was last noted over Lake Superior. The remaining highs separated from the permanent high in the Pacific. There was a singular motion, first northward up the Pacific Coast and then east and southeast toward the Atlantic.

LOWS.

Of the lows, VI and VIII began off the north Pacific Coast; II, VII, IX, and XI north of Montana in the subpermanent low in that region. IV and V began near Lake Superior, III in Nevada, I in North Carolina, and X off the middle Atlantic Coast. The general path was to the north of the United States and across the Lakes.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	1, a. m.	49	93	7, a. m.	37	83	2,000	6.0	334	13.9
II	5, a. m.	50	86	10, a. m.	33	78	1,660	5.0	332	13.8
III	5, a. m.	36	123	20, a. m.	38	72	5,330	15.0	355	14.8
IV	15, p. m.	34	121	24, p. m.	48	60	5,540	9.0	616	25.7
V	20, p. m.	47	128	28, a. m.	31	81	4,820	7.5	642	26.8
VI	24, a. m.	41	126	29, p. m.	33	100	3,280	5.5	596	24.8
VII	28, a. m.	52	113	31, p. m.	50	90	1,330	3.5	381	15.9
Total							23,960	51.5	3,256	
Mean of 7 paths							3,423	7.4	465	19.4
Mean of 51.5 days									465	19.4
Low areas.										
I	1, a. m.	36	82	6, a. m.	36	74	1,660	5.0	332	13.9
II	2, p. m.	55	111	5, a. m.	48	97	1,030	2.5	413	17.1
III	4, p. m.	42	117	10, p. m.	47	75	2,890	6.0	481	20.0
IV	10, a. m.	46	97	12, p. m.	48	77	1,430	2.5	574	23.9
V	12, p. m.	47	91	15, a. m.	49	68	1,280	2.5	514	21.4
VI	12, p. m.	48	128	17, p. m.	49	106	2,110	5.0	422	17.6
VII	18, p. m.	52	108	22, p. m.	45	61	2,800	4.0	700	29.2
VIII	19, p. m.	48	126	25, p. m.	44	67	3,220	6.0	536	22.3
IX	23, p. m.	53	119	28, p. m.	37	88	2,780	5.0	557	23.2
X	27, a. m.	41	69	29, p. m.	49	71	860	2.5	346	14.4
XI	27, p. m.	52	114	31, p. m.	51	68	2,230	4.0	556	23.2
Total							22,290	45.0	5,431	
Mean of 11 paths							2,026	4.1	494	20.6
Mean of 45 days									493	20.5

LOCAL STORMS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

No severe tornado occurred within the United States during April and May, 1897, and there was an absence of minor tornadoes and violent thunderstorms that stands in marked contrast to the record of the same months in 1896. May, 1897, was unusually free from violent atmospheric disturbances.

March storms not heretofore reported: March 18, Texas, Tarrant County, 8:20 p. m., central time: no funnel, whirl, counter clock-wise, moved from southwest to northeast, no fatalities, property loss small.

March 31.—Arkansas: First observed near Orlando, Cleveland County, about 7 miles southeast of New Edinburgh, Ark.; path ¼ to ½ mile wide; moved northeast. Observed again, near Star City, Lincoln County, and at Grady about 13 miles northeast of the latter. In all 7 persons, colored, were killed and probably a larger number injured. The path of the storm varied in width, and the length is not known. Property loss not large, probably not over $10,000, aside from the loss to crops and standing timber.

A minor tornado was observed near Tuckerman, Jackson County, about 3:00 p. m. of the same date. No casualties and but small property loss.

April 1.—Missouri: Heavy rains and in places severe hail storms occurred.

3d.—Kansas: Topeka, 1 p. m., central time: a small funnel cloud formed over the corporate limits of Topeka and moved slowly northward, a little above the housetops. The damage was confined principally to chimneys and roofs. The funnel cloud was not more than 40 feet wide and at no time descended to the ground. Pedestrians were warned of its approach by a buzzing noise and had abundant opportunity to get out of the way. The funnel cloud was very black and the whirling was plainly visible, but no wind effects were noticed, except in the immediate track of the funnel.

7th.—Texas: Severe rain and hail storms visited the northern part of the State.

8th.—Indiana: Heavy rain and snow interrupted telephonic and telegraphic communication. Alabama and Georgia: Severe local storms occurred in Albany, Folkston, and Valdosta, Ga., and Ozark, Ala.; one life was lost by falling timbers at the last-named place.

19th.—Illinois and Michigan: High winds and gales prevailed over Lake Michigan and the adjacent territory; 5 persons were injured in Chicago by the falling of signs, derricks, etc.

22d.—Kansas: Four miles north of McFarland, Wabaunsee County, 8:45 p. m., central time: 1 killed, 7 injured; property loss about $2,000; path from 50 to 200 feet wide, and 15 miles long; moved a little east of north. One mile west of Newton, 10:00 p. m., central time: no fatalities, 3 injured, property loss about $2,000: moved a little east of north; path 150 feet wide and 12 miles long; destruction not continuous over the entire length.

23d.—Iowa: Anamosa, 8:50 p. m., central time: no casualties, property loss under $5,000; path 300 feet wide, 5 miles long; moved a little east of north.

24th.—Michigan: Omer, Arenac County, 5:30 p. m., central time: 3 injured; property loss about $4,800; path about 40 feet wide and a half mile long. Mr. C. F. Schneider, Section Director of the Michigan Climate and Crop Service, makes the following report upon the meteorological conditions on the day of the tornado:

> The morning at Omer was clear and warm with a fresh southeast wind; toward noon the sky began to cloud over rapidly and the wind to increase in force. During the afternoon the clouds lowered and began to assume a threatening appearance, and the southeast wind increased to a gale of about 30 miles per hour. By 5:00 p. m. the sky was very dark and the wind had become strong enough to loosen signs and boards, and it had begun to shift to the south-southeast. At this time a violent thunderstorm set in, the thunder and lightning being continuous. The thunderstorm moved from the southwest to the northeast, and in advance of the tornado. About 5:15 p. m. a light sprinkle of rain fell for a few minutes, and this was followed by a light fall of small, opaque hailstones. During the half hour from 5:00 to 5:30 p. m , the wind continued to blow a gale from the south-southeast, and this wind was very warm and somewhat suffocating. At 5:30 p. m. (as near as can be determined) the tornado cloud suddenly made its appearance from the southwest.
>
> This tornado cloud was typical in form, being described by such citizens as saw it, as "balloon shaped," or, as text books speak of such phenomena, "funnel shaped." It was about 40 feet high, its top having a steady forward movement, but the lower part of it, which corresponds to the basket or car of a balloon, had an unsteady motion, moving from side to side, and in advance, and sometimes in the rear of the body of the cloud. The whole cloud had a wavy horizontal movement, sometimes being nearly in contact with the earth, and then lifting up for some distance. It was accompanied by a peculiar roar.

May 8th.—Kansas: One mile west of Ulysses, 3 p. m., central time: no casualties; one building destroyed; path 100 yards wide, ½ mile long.

May 9th.—Arkansas: Corning, 5 p. m., central time: no casualties; property loss about $200; width of path 200 to 300 yards, length, 2 miles; moved northeast.

TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

Both the mean temperatures and the departures from the normal are given in Table I for the regular stations of the

Weather Bureau, which also gives the height of the thermometers above the ground at each station. The mean temperature is given for each station in Table II, for voluntary observers.

The *monthly mean temperatures* published in Table I, for the regular stations of the Weather Bureau, are the simple means of all the daily maxima and minima; for voluntary stations a variety of methods of computation is necessarily allowed, as shown by the notes appended to Table II.

The *regular diurnal period* in temperature is shown by the hourly means given in Table V for 29 stations selected out of 82 that maintain continuous thermograph records.

The *distribution of the observed monthly mean* temperature of the air over the United States and Canada is shown by the dotted isotherms on Chart IV; the lines are drawn over the Rocky Mountain Plateau region, although the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country occupied by our observers; such isotherms are controlled largely by the local topography, and should be drawn and studied in connection with a contour map.

The *highest mean temperatures* were: In the United States, Yuma, 80.4; Phœnix, 79.5; Key West, 77.8; Corpus Christi, 75.8. In Canada, Bermuda, 70.0; Spences Bridge, 61.5; Battleford and Swift Current, 56.9; Calgary, 55.8; Edmonton, 55.4. The lowest were: In the United States, Sault Ste. Marie, 45,8; Marquette, 47.6; Eastport, 46.2; Portland, Me., 46.6; Alpena, 48.6. In Canada, Father Point, 42.8; White River, 45.6; Port Arthur, 45.8; Sydney, 47.2; St. Johns, N. F., 47.8.

As compared with the normal for May the mean temperature for the current month was in excess over the Plateau Region, the northern and the Pacific slopes, the Canadian Northwest Territories and Maritime Provinces. It was deficient in the Mississippi Valley, Atlantic States, and the Lake Region.

The greatest excesses were: In the United States, Havre, 7.3; Miles City, 7.1; Helena and Idaho Falls, 7.0; Winnemucca, 6.9; Rapid City, 6.7. In Canada, Swift Current, 5.9; Edmonton, 5.8; Calgary, 4.8; Qu'Appelle, 4.2. The largest deficits were: Cincinnati, 5.0; Parkersburg and Indianapolis, 4.9: Pittsburg and Louisville, 4.5; Lexington, 4.0. In Canada, Quebec, Montreal, and Toronto, 1.4; Saugeen, 1.2; Kingston, 0.9.

Considered by districts the mean temperatures of the current month show departures from the normal as given in Table I. The greatest positive departures were: Northern Slope, 5.6; middle Plateau, 5.2; northern Plateau, 5.0. The greatest negative departures were: South Atlantic, 1.5; Florida Peninsula and East Gulf, 1.6; Ohio Valley and Tennessee, 3.9.

In Canada.—Prof. R. F. Stupart says:

In British Columbia and the Northwest Territories the mean temperature of the month was very much above average, the greatest excess being between 9° and 12° in southern Alberta. The line of no departure passes through eastern Manitoba, Port Arthur, and White River. Nearly all Ontario shows a mean temperature ranging from average to 3° below. Quebec stations all show about 1° degree below average. In the Maritime Provinces the departure ranged from zero to plus 3°.

The years of highest and lowest mean temperatures for May are shown in Table I of the REVIEW for May, 1894. The mean temperature for the current month was the highest on record at: Red Bluff, 72.6; Fresno, 71.7; Sacramento, 67.0; Walla Walla, 65.3; Salt Lake City, 63.4; Spokane, 62.4; Winnemucca, 60.8; Havre, 60.6; Helena, 60.0; Rapid City, 59.8; Carson City, 59.4; Idaho Falls, 58.6; Baker City, 58.2. It was the lowest on record at: Parkersburg, 58.6; Indianapolis, 58.8; Lexington, 59.4; Cincinnati, 59.5; Louisville, 61.6; Nashville, 64.4.

The *maximum and minimum temperatures* of the current month are given in Table I. The highest maxima were: 104, Phœnix (28th); 102, Yuma (28th); 100, Walla Walla (29th); 99, Fresno (20th); 98, Red Bluff (19th); 95, Spokane (29th). The lowest maxima were: 64, Eastport (5th); 65, Woods Hole (18th); 66, Nantucket (frequently); 67, San Diego (frequently) and Tatoosh Island (13th); 68, Block Island (18th); 70, Eureka (11th) and Narragansett Pier (18th). The highest minima were: 70, Key West (8th); 62, Galveston (1st); 60, Corpus Christi (2d); 59, Port Eads (frequently). The lowest minima were: 24, Northfield (8th); 25, Williston (13th); 26, Moorhead (24th); 27, Huron (24th), Idaho Falls (8th); 28, Bismarck and North Platte (14th), Cheyenne (9th); 29, Carson City and Winnemucca (8th), Lander (9th).

The *years of highest maximum and lowest minimum temperatures* for May are given in the last four columns of Table I of the REVIEW for May, 1896. During the current month the maximum temperatures were equal to or above the highest on record at: Walla Walla, 100; Spokane, 95; Idaho Falls, 89; Baker City, 88; Fort Canby, 85. The minimum temperatures were equal to or below the lowest on record at: Cincinnati and Columbus, Ohio, 33.

The *greatest daily range of temperature and the data for computing the extreme and mean monthly ranges* are given for each of the regular Weather Bureau stations in Table I. The largest values of the greatest daily ranges were: Moorhead, 48; Williston, 45; Huron and Havre, 44; Bismarck and Carson City, 43. The smallest values were: San Diego, 11; Galveston, 13; Key West, 14; Nantucket, 15; Tatoosh Island, 18; Block Island and Hatteras, 19.

Among the *extreme monthly ranges* the largest were: Williston, 65; Moorhead, 64; Bismarck and Idaho Falls, 62; Winnemucca, 61; Walla Walla and Huron, 60. The smallest values were: Key West, 16; San Diego, 17; Galveston, 21; Woods Hole, 23; Tatoosh Island, 24; Nantucket, 25; Block Island, Hatteras, Port Eads, and Corpus Christi, 26.

Accumulated monthly departures from normal temperatures from January 1 to the end of the current month are given in the second column of the following table, and the average departures are given in the third column for comparison with the departures of current conditions of vegetation from the normal condition.

Districts.	Accumulated departures.		Districts.	Accumulated departures.	
	Total.	Average.		Total.	Average.
	°	°		°	°
New England	+ 5.6	+ 1.1	South Atlantic	− 0.5	− 0.1
Middle Atlantic	+ 2.4	+ 0.5	East Gulf	− 1.0	− 0.2
Florida Peninsula	+ 0.9	+ 0.2	Ohio Valley and Tenn.	− 1.5	− 0.3
West Gulf	+ 4.5	+ 0.9	North Dakota	− 3.9	− 0.8
Lower Lake	+ 3.8	+ 0.8	Southern Slope	− 0.8	− 0.2
Upper Lake	+ 8.3	+ 1.7	Southern Plateau	− 3.4	− 0.7
Upper Mississippi Valley	+ 1.5	+ 0.3	Middle Plateau	− 4.1	− 0.8
Missouri Valley	+ 0.9	+ 0.2	Middle Pacific	− 2.5	− 0.5
Northern Slope	+ 1.0	+ 0.2	South Pacific	− 2.2	− 0.4
Middle Slope	+ 2.3	+ 0.5			
Northern Plateau	+ 9.5	+ 1.9			
North Pacific	+ 0.2	+ 0.0			

MOISTURE.

The *quantity of moisture* in the atmosphere at any time may be expressed by the weight of the vapor coexisting with the air contained in a cubic foot of space, or by the tension or pressure of the vapor, or by the temperature of the dew-point. The mean dew-point for each station of the Weather Bureau, as deduced from observations made at 8 a. m. and 8 p. m., daily, is given in Table I.

The *rate of evaporation* from a special surface of water on muslin at any moment determines the temperature of the wet-bulb thermometer. The mean wet-bulb temperature is now published in Table I; it is always intermediate, and

generally about half way between the temperature of the air and of the dew-point. The quantity of water evaporated in a unit of time from the muslin surface may be considered as depending essentially upon the wet-bulb temperature, the dew-point, and the wind.

The *relative humidity*, or the ratio between the moisture that is present in the air and the moisture that it would contain if saturated at its observed temperature is given in Table I as deduced from the 8 a. m. and 8 p. m. observations. The general average for a whole day or any other interval would properly be obtained from the data given by an evaporometer, but may also be obtained, approximately, from frequent observations of the relative humidity.

PRECIPITATION.

[In inches and hundredths.]

The *distribution of precipitation* for the current month, as determined by reports from about 2,500 stations, is exhibited on Chart III. The numerical details are given in Tables I, II, and III. The total precipitation for the current month exceeded 10 inches in the neighborhood of Jupiter, and exceeded 6 inches in southeast Florida, central Texas, southern Maine, Connecticut, New York, northern New Jersey, and eastern Pennsylvania. Little or no rain fell in the central and southern Plateau Region and California.

The larger values for regular stations were: Jupiter, 10.73; Portland, Me., and Eastport, 7.88; Washington, 6.97; Baltimore, 6.88.

Details as to *excessive precipitation* are given in Tables XI and XII.

The *diurnal variation*, as shown by tables of hourly means of the total precipitation, deduced from the self-registering gauges kept at the regular stations of the Weather Bureau, is not now tabulated.

The *current departures* from the normal precipitation are given in Table I, which shows that precipitation was in excess in New England, and especially in northwestern Texas and eastern New Mexico. It was deficient in the Valley of the Mississippi and tributaries.

The large excesses were: Jupiter, 4.9; Eastport, 4.2; Santa Fe, 3.3; Baltimore, 3.1; Washington, 3.0; Amarillo, 2.4. In Canada, Yarmouth, 2.5; Quebec, 2.0. The large deficits were: New Orleans and Little Rock, 4.6; Vicksburg, 4.0; Springfield, Mo., and Yankton, 3.6; Kansas City and Montgomery, 3.4; Meridian and Atlanta, 3.2; Topeka and St. Louis, 3.0.

The *average departure* for each district is given in Table I. By dividing each current precipitation by its respective normal the following corresponding percentages are obtained (precipitation is in excess when the percentage of the normal exceeds 100):

Above the normal: New England, 120; Middle Atlantic, 135; Florida Peninsula, 130; southern Slope, 165; southern Plateau, 300.

Below the normal: South Atlantic, 63; east Gulf, 31; west Gulf, 59; Ohio Valley and Tennessee, 87; lower Lake, 89; upper Lake, 76; North Dakota, 37; upper Mississippi, 43; Missouri Valley, 37; northern Slope, 49; middle Slope, 80; middle Plateau, 56; northern Plateau, 74; north Pacific, 61; middle Pacific, 21; south Pacific, 19.

In Canada.—Prof. R. F. Stupart reports:

The rainfall was considerably below the average in British Columbia, and less so in the Northwest Territories and Manitoba. It was somewhat in excess in Ontario and Quebec. It was slightly above average in Prince Edward Island and eastern Nova Scotia, but very excessive in southern New Brunswick and western Nova Scotia.

The *years of greatest and least precipitation* for May are given in the REVIEW for May, 1890. The precipitation for the current month was the greatest on record at: Santa Fe, 4.35. It was the least on record at: Columbus, Mo., 3.19; Raleigh, 2.85; Springfield, Mo., 2.48; Kansas City, 1.24; Nashville, 1.22; Cairo, 1.12; Chicago, 0.84; Moorhead, 0.80; Eureka, 0.75; Montgomery, 0.68; Havre, 0.42; Miles City, 0.35; Atlanta, 0.34; Tampa, 0.33; Carson City, 0.23; North Platte, 0.11; Red Bluff, 0.06: Point Reyes Light, 0.02; Fresno, 0.00.

The *total accumulated monthly departures* from January 1 to the end of the current month are given in the second column of the following table: The third column gives the percentage of the current accumulated precipitation relative to its normal value.

Districts.	Accumulated departures.	Accumulated precipitation.	Districts.	Accumulated departures.	Accumulated precipitation.
	Inches.	*Per ct.*		*Inches.*	*Per ct.*
Florida Peninsula	+ 5.60	138	New England	− 1.00	89
Ohio Valley and Tenn	+ 2.30	111	Middle Atlantic	− 1.50	92
Upper Mississippi Valley	+ 1.80	114	South Atlantic	− 1.50	93
Missouri Valley	+ 0.70	106	East Gulf	− 1.80	92
Middle Slope	+ 1.20	114	West Gulf	− 2.70	86
Southern Slope	+ 2.30	131	Lower Lake	− 1.20	91
Southern Plateau	+ 2.30	197	Upper Lake	− 0.30	98
Middle Plateau	+ 0.40	106	North Dakota	− 0.70	89
South Pacific	+ 0.90	112	Northern Slope	− 0.80	87
			Northern Plateau	− 0.20	98
			North Pacific	− 1.90	93
			Middle Pacific	− 2.40	87

SNOWFALL.

The *total monthly snowfall* at each station is given in Tables I and II. The chart of geographical distribution is omitted for this month.

Snowfalls of from 4 to 23 inches were reported from mountain stations in Colorado; from 1 to 2½ inches in the mountains of western Montana; 4 inches or less in Ohio, Indiana, Kentucky, and West Virginia, and generally a trace in central Maine, the upper Lake Region, Wisconsin, and Minnesota.

The *depth of snow on the ground* was not appreciable at the end of the month.

In Canada.—The map for May, published by Prof. R. F. Stupart, makes no special mention of snowfall, but local reports show that light snows fell in Manitoba and the region north of Lake Superior; also in New Brunswick, Nova Scotia, and Newfoundland, but all disappeared very soon.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 12. Arizona, 19, 29. Arkansas, 28. California, 14, 15, 23. Colorado, 4, 5, 8, 9, 14, 16, 18, 20, 21, 24, 29, 30. Delaware, 18, 21. District of Columbia, 24. Florida, 15, 24. Idaho, 3, 6, 7, 8, 15, 19, 20, 24, 25, 30, 31. Illinois, 8, 9, 13, 14, 15. Indiana, 9, 11, 14, 15, 20 to 24. Indian Territory, 10. Iowa, 8, 10, 12, 13, 14, 19. Kansas, 2, 8, 9, 10, 21, 22, 25. Kentucky, 9, 23, 24. Louisiana, 1, 11, 13, 14. Maine, 7, 29. Maryland, 21, 24, 25. Massachusetts, 7. Michigan, 11, 13, 14, 19, 23, 30. Minnesota, 11 to 15. Mississippi, 8, 30. Missouri, 2, 8, 20, 22, 26, 28. Montana, 9, 16, 30. Nebraska, 10, 11, 17, 18, 20, 31. Nevada, 1, 2, 7, 8, 17, 18, 21, 23, 24. New Jersey, 21. New Mexico, 3, 4, 6, 15 to 21, 23, 25, 26, 27. New York, 4. North Carolina, 1, 5, 13, 14, 17, 24, 29, 30. North Dakota, 7, 10, 11, 25, 26. Ohio, 9, 12, 14, 15, 16, 20, 23, 24, 27. Oklahoma, 4, 6, 8, 9, 10, 12, 13, 22. Oregon, 4 to 7, 16, 24. Pennsylvania, 16, 21, 23, 24. South Dakota, 8, 11, 12, 13, 16, 18, 26. Tennessee, 8, 9, 21, 24. Texas, 4 to 7, 10 to 13, 16, 17, 23. Utah, 1, 15, 20, 24. Virginia, 1, 5, 11, 16, 17, 21, 23, 24. Washington, 5, 6, 7, 12, 29, 30. West Virginia, 24, 29, 30. Wisconsin, 12, 13, 14, 29, 31. Wyoming, 2, 19.

SLEET.

The following are the dates on which sleet fell in the respective States:

California, 17. Colorado, 3, 4, 10, 27, 31. Illinois, 2. Indiana, 1, 2. Iowa, 13. Michigan, 1, 2, 30, 31. Minnesota, 14, 23. Montana, 9. North Dakota, 11. Ohio, 1, 2. Virginia, 2, 3. West Virginia, 2. Wisconsin, 12, 30.

WIND.

The *prevailing winds* for May, 1897, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

The *resultant winds*, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table VIII. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

Maximum wind velocities are given in Table I, which also gives the altitudes of the Weather Bureau anemometers above the ground. Maxima of 50 miles or more per hour were reported during this month at regular stations of the Weather Bureau as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				*Miles*	
Fort Canby, Wash	6	57	s.	Tatoosh Island, Wash	28	55	e.
Idaho Falls, Idaho	25	51	s.				

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 22 regular stations of the Weather Bureau by its photographic, and at 39 by its thermal effects; at one of these stations records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table X for each hour of local mean time. In order to complete the record of the duration of cloudiness these registers are supplemented by special personal observations of the state of the sky near the sun in the hours after sunrise and before sunset, and the cloudiness for these hours has been added as a correction to the instrumental records, whence there results a complete record of the duration of sunshine from sunrise to sunset.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table X for the 60 stations at which instrumental self-registers are maintained.

COMPARISON OF DURATIONS AND AREAS.

The sunshine registers give the *durations* of effective sunshine whence the durations relative to possible sunshine are derived; the observers' personal estimates give the percentage of *area* of clear sky. These numbers have no necessary relation to each other, since stationary banks of clouds may obscure the sun without covering the sky, but when all clouds have a steady motion past the sun and are uniformly scattered over the sky, the percentages of duration and of area agree closely. For the sake of comparison, these percentages have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for May, 1897, is 10 per cent for photographic and 11 per cent for thermometric records.

The details are shown in the accompanying table, in which the stations are arranged according to the *total possible* duration of sunshine, and not according to the *observed* duration.

Difference between instrumental and personal observations of sunshine.

Stations.	Latitude.		Apparatus.	For whole month.		Instrumental record of sunshine.			
				Total possible.	Personal.	Photographic.	Difference.	Thermometric.	Difference.
	°	′		*Hrs.*	%	%	%	%	%
Key West	24	34	T.	414.6	64	.....	.....	84	+20
Tampa, Fla	27	57	T.	419.8	77	.....	.....	79	+ 2
Galveston, Tex	29	18	P.	421.8	68	74	+ 6	.....	.....
New Orleans, La	29	58	T.	423.7	63	.....	.....	62	− 1
Savannah, Ga	32	05	P.	428.4	68	77	+ 9	.....	.....
Vicksburg, Miss	32	22	T.	428.4	74	.....	.....	87	+13
San Diego, Cal	32	43	P.	430.7	49	49	0	.....	.....
Charleston, S. C.	32	47	T.	430.7	70	.....	.....	80	+10
Phœnix, Ariz	32	28	P.	430.7	82	93	+11	.....	.....
Atlanta, Ga	33	45	T.	432.6	62	.....	.....	73	+11
Los Angeles, Cal	34	03	P.	432.6	45	50	+ 5	.....	.....
Wilmington, N. C.	34	14	T.	432.6	61	.....	.....	71	+10
Little Rock, Ark	34	45	T.	434.2	56	.....	.....	80	+24
Chattanooga, Tenn	35	04	T.	434.2	53	.....	.....	57	+ 4
Santa Fe, N. Mex	35	41	P.	436.7	52	60	+ 8	.....	.....
Raleigh, N. C.	35	45	T.	436.7	51	.....	.....	68	+17
Nashville, Tenn	36	10	T.	436.7	64	.....	.....	69	+ 5
Fresno, Cal	36	43	T.	439.0	83	.....	.....	88	+ 5
Dodge City, Kans	37	45	P.	441.7	58	63	+ 5	.....	.....
San Francisco, Cal	37	48	T.	441.7	59	.....	.....	72	+13
Louisville, Ky	38	15	T.	441.7	48	.....	.....	70	+22
St. Louis, Mo	38	38	T.	443.8	60	.....	.....	75	+15
Washington, D. C	38	54	P.	443.8	55	60	+ 5	.....	.....
Kansas City, Mo	39	05	P.	443.8	57	59	+ 2	.....	.....
Cincinnati, Ohio	39	06	T.	443.8	55	.....	.....	63	+ 8
Baltimore, Md	39	18	T.	443.8	48	.....	.....	58	+10
Atlantic City, N. J	39	22	P.	443.8	50	63	+13	.....	.....
Denver, Colo	39	45	P.	446.7	43	72	+29	.....	.....
Indianapolis, Ind	39	46	T.	446.7	58	.....	.....	67	+ 9
Philadelphia, Pa	39	57	T.	446.7	44	.....	.....	71	+27
Columbus, Ohio	39	58	T.	446.7	49	.....	.....	59	+10
Harrisburg, Pa	40	16	T.	446.7	38	.....	.....	68	+30
Pittsburg, Pa	40	32	T.	449.1	45	.....	.....	47	+ 2
New York, N. Y	40	43	T.	449.1	48	.....	.....	68	+20
Salt Lake City, Utah	40	46	P.	449.1	36	73	+37	.....	.....
Eureka, Cal	40	48	P.	449.1	47	53	+ 6	.....	.....
Cheyenne, Wyo	41	08	P.	449.1	43	65	+22	.....	.....
Omaha, Nebr	41	16	P.	449.1	60	70	+10	.....	.....
Cleveland, Ohio	41	30	T.	451.9	39	.....	.....	40	+ 1
Des Moines, Iowa	41	35	T.	451.9	67	.....	.....	72	+ 5
Chicago, Ill	41	53	T.	451.9	57	.....	.....	62	+ 5
Erie, Pa	42	07	T.	451.9	47	.....	.....	54	+ 7
Binghamton, N. Y	42	08	T.	451.9	38	.....	.....	46	+ 8
Detroit, Mich	42	20	T.	451.9	42	.....	.....	54	+12
Boston, Mass	42	21	T.	451.9	35	.....	.....	43	+ 8
Dubuque, Iowa	42	30	T.	451.9	75	.....	.....	72	− 3
Albany, N. Y	42	39	T.	454.9	42	.....	.....	53	+11
Buffalo, N. Y.*	42	53	T.	454.9	38	.....	.....	59	+17
Rochester, N. Y	43	08	T.	454.9	41	.....	.....	43	+ 2
Idaho Falls, Idaho	43	29	T.	454.9	67	.....	.....	64	− 3
Portland, Me	43	39	T.	457.9	23	.....	.....	43	+20
Northfield, Vt	44	10	P.	457.9	32	43	+11	.....	.....
Eastport, Me	44	54	P.	460.7	20	28	+ 8	.....	.....
St. Paul, Minn †	44	58	P.	460.7	48	.....	.....	47	+12
Minneapolis, Minn	44	59	T.	460.7	.....	.....	.....	54	.....
Portland, Oreg	45	32	T.	464.1	58	.....	.....	61	+ 3
Portland, Oreg	45	32	P.	464.1	58	61	+ 3	.....	.....
Helena, Mont	46	34	P.	467.4	63	69	+ 6	.....	.....
Bismarck, N. Dak	46	47	P.	467.4	65	71	+ 6	.....	.....
Seattle, Wash	47	38	T.	471.3	51	.....	.....	68	+17
Spokane, Wash	47	40	P.	471.3	59	70	+11	.....	.....

* Buffalo, N. Y.—Instrumental record is for 28 days, for which the total possible is 412.4; the instrumental, 244.1; instrumental percentage, 59; personal estimate, 42, and difference, +17.

† St. Paul, Minn.—The instrumental record is for 21 days, for which the total possible is 316.1; instrumental record, 149.4; instrumental percentage, 47; personal percentage, 35; difference, +12.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 9th, 191; 12th, 180; 20th and 23d, 154; 21st, 179; 24th, 162.

Reports were most numerous in: Colorado, 171; Missouri, 183; North Carolina, 172; Ohio, 170; Texas, 130.

Thunderstorm days were most numerous in: Colorado, 29; Missouri, 21; New Mexico, 24; North Carolina, 22; Texas, 20.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 11th to the 19th, inclusive. On the remaining twenty-two days of this month 77 reports were received, or an average of about 4 per day. The dates on which the number of reports of auroras for the whole country especially exceeded this average were: 20th, 12; 21st, 14; 29th, 16.

Reports were most numerous in: Michigan, 7; Minnesota, Montana, and Wisconsin, 8; North Dakota, 15.

The number of reports was a large percentage of the number of observers in: North Dakota, 40; Montana, 20; Delaware, 50.

CANADIAN REPORTS.

Thunderstorms were reported as follows: Grindstone, 21st; Grand Manan, 22d; Yarmouth, 13th, 31st; Charlottetown, 21st; Father Point, 31st; Quebec, 24th; Montreal, 20th; Rockliffe, 12th, 14th; Toronto, 10th, 12th; White River, 23d; Ottawa, 14th, 31st; Port Stanley, 9th, 12th, 14th, 21st; Parry Sound, 9th, 12th, 30th; Winnipeg, 8th; Minnedosa, 7th; Qu'Appelle, 21st; Swift Current, 6th, 15th to 18th; Prince Albert, 22d; Esquimalt, 6th, 30th; Kamloops, 29th; Banff, 6th, 30th.

Auroras were reported as follows: Charlottetown, 19th; Father Point, 19th; Quebec, 21st; Montreal, 29th; Port Arthur, 22d; Winnipeg, 5th, 20th, 21st, 27th; Minnedosa, 6th, 21st, 31st; Qu'Appelle, 29th; Esquimalt, 21st; Kamloops, 20th.

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Snowfall and rainfall are expressed in inches.

Alabama.—The mean temperature was 68.6°, or 4.7° below normal; the highest was 97°, at Eufaula on the 29th, and the lowest, 32°, at Maple Grove on the 2d. The average precipitation was 1.56, or 2.39 below normal; the greatest monthly amount, 5.63, occurred at Scottsboro, and the least, trace, at Fort Deposit.—*F. P. Chaffee.*

Arizona.—The mean temperature was 73.7°, or 4.8° above normal; the highest was 112°, at Parker on the 22d, and the lowest, 32°, at Fort Apache on the 3d. The average precipitation was 0.02, or 0.30 below normal; the greatest monthly amount, 0.95, occurred at Russellville; twelve stations report no precipitation and seven stations report only traces.—*W. T. Blythe.*

Arkansas.—The mean temperature was 68.3°, or 0.7° below normal; the highest was 99°, at Lutherville on the 28th, and the lowest, 33°, at Jonesboro on the 26th. The average precipitation was 2.13, or 2.75 below normal; the greatest monthly amount, 7.47, occurred at Arkansas City, and the least, 0.34, at Helena.—*F. H. Clarke.*

California.—The mean temperature was 66.9°, or 2.8° above normal; the highest was 116°, at Volcano Springs on the 28th, and the lowest, 18°, at Bodie on the 9th. The average precipitation was 0.18, or 0.71 below normal; the greatest monthly amount, 2.47, occurred at Fordyce Dam, while none fell at numerous places.—*J. A. Barwick.*

Colorado.—The mean temperature was 56.1°, or 3.9° above normal; the highest was 96°, at Lamar on the 25th, and the lowest, 15°, at Breckenridge on the 11th. The average precipitation was 2.05, or about normal; the greatest monthly amount, 5.37, occurred at Santa Clara, and the least, 0.09, at Rangely.—*F. H. Brandenburg.*

Florida.—The mean temperature was 74.0°, or 2.0° below normal; the highest was 99°, at Emerson and Lake City on the 22d, and the lowest, 47°, at Fort Meade and Tallahassee on the 2d and at Manatee on the 3d. The average precipitation was 2.22, or about 1.50 below normal; the greatest monthly amount, 11.00, occurred at Boca Raton, and the least, 0.27, at Mullet Key.—*A. J. Mitchell.*

Georgia.—The mean temperature was 69.3°, or 2.2° below normal; the highest was 98°, at Bellville on the 29th, and the lowest, 34°, at Greenbush and Ramsey on the 2d. The average precipitation was 1.52, or 2.04 below normal; the greatest monthly amount, 4.61, occurred at Monticello, while none fell at Gillsville.—*J. B. Marbury.*

Idaho.—The mean temperature was 59.1°; the highest was 100°, at Boise and Lewiston on the 29th, and the lowest, 18°, at Swan Valley on the 8th. The average precipitation was 0.96; the greatest monthly amount, 2.94, occurred at Lewiston and Warren, and the least, 0.23, at Blackfoot.—*D. P. McCallum.*

Illinois.—The mean temperature was 2.6° below normal; the highest was 90°, at Atwood on the 7th, at Olney on the 8th, and at Mascoutah on the 20th; the lowest was 27°, at Scales Mound on the 31st. The average precipitation was 2.43 below normal; the greatest monthly amount, 4.09, occurred at Morrisonville, and the least, 0.84, at Chicago.—*C. E. Linney.*

Indiana.—The mean temperature was 58.1°, or 3.7° below normal; the highest was 91°, at Washington on the 9th, and the lowest, 23°, at Laporte on the 2d. The average precipitation was 3.20, 0.96 below normal; the greatest monthly amount, 5.94, occurred at Bluffton, and the least, 1.39, at Columbus.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 59.6°, or 1.5° below normal; the highest was 96°, at Fort Madison on the 6th, and the lowest, 20°, at New Hampton on the 31st. The average precipitation was 1.92, or 2.26, below normal; the greatest monthly amount, 3.59, occurred at Indianola, and the least, 0.21, at Larchwood.—*G. M. Chappel.*

Kansas.—The mean temperature was 64.1°, or 0.1° below normal; the highest was 98°, at Frankfort on the 26th, and the lowest, 30°, at Minneapolis, Phillipsburg, and Salina on the 14th. The average precipitation was 2.04, or 1.59 below normal; the greatest monthly amount, 5.02, occurred at Newton, and the least, 0.01, at Lakin.—*T. B. Jennings.*

Kentucky.—The mean temperature was 61.5°, or 3.6° below normal; the highest was 91°, at Henderson and Shelbyville on the 8th, and the lowest, 32°, at Caddo on the 2d. It was the coolest May since the organization of the service, and light frosts were reported frequently during the month, but no material damage resulted from them. The average precipitation was 3.27, or 1.04 below normal; the greatest monthly amount, 6.04, occurred at Middlesboro, and the least, 1.22, at Pilot Oak.—*Frank Burke.*

Louisiana.—The mean temperature was 72.0°, or 1.3° below normal; the highest was 96°, at Montgomery on the 26th, and at Oakridge on the 27th; the lowest was 42°, at Cheneyville and Robeline on the 2d. The average precipitation was 2.14, or 1.34 below normal; the greatest monthly amount, 5.29, occurred at Alexandria, and the least, 0.15, at Houma.—*R. E. Kerkam.*

Maryland and Delaware.—The mean temperature was 61.1°, or 1.2° below normal; the highest was 86°, at Flintstone on the 20th and at Westernport on the 9th and 20th; the lowest was 27°, at Deerpark on the 29th. The average precipitation was 5.13, or 1.20 above normal; the greatest monthly amount, 7.52, occurred at Westernport, and the least, 2.41, at Solomons.—*F. J. Walz.*

Michigan.—The mean temperature was 51.9°, or 3.1° below normal; the highest was 89°, at Grand Rapids on the 9th and 20th and at Carsonville on the 10th; the lowest was 14°, at Humboldt on the 16th and 26th. The average precipitation was 3.28, or 0.35 below normal; the greatest monthly amount, 5.89, occurred at Rogers, and the least, 1.13, at Muskegon.—*C. F. Schneider.*

Minnesota.—The mean temperature was 55.2°, or 1.2° below normal; the highest was 94°, at Bonniwells Mills on the 5th, and the lowest, 20°, at Tower on the 2d. The average precipitation was 1.38, or 1.69 below

normal; the greatest monthly amount, 3.50, occurred at Milaca, and the least, 0.03, at Bermidji.—*T. S. Outram.*

Mississippi.—The mean temperature was 70.1°, or 2.2° below normal; the highest was 100°, at Columbus on the 29th, and the lowest, 37°, at French Camp on the 2d. The average precipitation was 1.69, or 2.46 below normal; the greatest monthly amount, 4.63, occurred at Magnolia, and the least, 0.37, at Austin.—*R. J. Hyatt.*

Missouri.—The mean temperature was 62.4°, or 1.3° below normal; the highest was 93°, at Darksville on the 20th, and the lowest, 28°, at Potosi on the 2d. The average precipitation was 2.57, or 2.24 below normal; the greatest monthly amount, 5.38, occurred at Sedalia, and the least, 0.70, at Sublett.—*A. E. Hackett.*

Montana.—The mean temperature was 59.0°, or 5.0° above normal; the highest was 98°, at Glendive on the 17th, and the lowest, 20°, at Radersburg on the 1st and at St. Pauls on the 2d. The average precipitation was 1.10 below normal; the greatest monthly amount, 2.91, occurred at Virginia City, and the least, 0.18, at Glasgow.—*R. M. Crawford.*

Nebraska.—The mean temperature was 61.3°, or 2.2° above normal; the highest was 101°, at Franklin on the 25th, and the lowest, 19°, at Kennedy on the 13th. The average precipitation was 1.66, or 1.95 below normal; the greatest monthly amount, 7.09, occurred at Tecumseh, and the least, 0.01, at Wallace.—*G. A. Loveland.*

Nevada.—The mean temperature was 60.0°, or 3.7° above normal; the highest was 99°, at Downeyville on the 29th, and the lowest, 12°, at Monitor Hill on the 8th. The average precipitation was 0.59, or 0.38 below normal; the greatest monthly amount, 1.85, occurred at Toano, while none fell at Beowawe and Mill City.—*R. F. Young.*

New England.—The mean temperature was 55.6°, or about normal; the highest was 85°, at Lawrence, Mass., on the 18th, and at Westboro, Mass., on the 10th; the lowest was 17°, at West Milan, N. H., on the 8th. The average precipitation was 4.80, or 1.10 above normal; the greatest monthly amount, 7.86, occurred at Eastport, Me., and the least, 2.30, at Nantucket, Mass.—*J. W. Smith.*

New Jersey.—The mean temperature was 60.6°, or 0.4° below normal; the highest was 88°, at Allaire on the 10th, and the lowest, 29°, at Charlotteburg on the 8th. The average precipitation was 5.68, or 1.50 above normal; the greatest monthly amount, 9.11, occurred at Sergeantsville, and the least, 1.71, at Atlantic City.—*E. W. McGann.*

New Mexico.—The mean temperature was about normal; the highest was 101°, at San Marcial on the 9th, and the lowest, 19°, at Goldhill on the 4th. The average precipitation was above normal, except in the southwest quarter; extremely heavy rain fell in the northeastern portion; the greatest monthly amount, 9.73, occurred at Fort Union.—*H. B. Hersey.*

New York.—The mean temperature was 55.5°, or 0.8° below normal; the highest was 97°, at Cortland on the 9th, and the lowest, 23°, at Saranac Lake on the 7th and New Lisbon on the 8th. The average precipitation was 4.05, or 0.57 above normal; the greatest monthly amount, 9.83, occurred at Bedford, and the least, 1.33, at Rochester.—*R. M. Hardinge.*

North Carolina.—The mean temperature was 64.6°, or 2.4° below normal; the highest was 92°, at Goldsboro on the 24th, at Lumberton on the 30th, and at Rockingham and Southern Pines on the 29th, the lowest was 28°, at Highlands on the 2d. The average precipitation was 3.73, or 0.52 below normal; the greatest monthly amount, 6.98, occurred at Chapelhill, and the least, 0.99, at Waynesville.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 55.4°, or 1.8° above normal; the highest was 97°, at Ashley on the 17th, and the lowest, 16°, at Gallatin on the 24th. The average precipitation was 0.71, or 1.93 below normal; the greatest monthly amount, 1.84, occurred at Hamilton, and the least, trace, at Milton.—*B. H. Bronson.*

Ohio.—The mean temperature was 56.3°, or 3.9° below normal; the highest was 91°, at Cherryfork and Portsmouth on the 7th, and the lowest, 25°, at Millport on the 31st. The month was the coolest May on record. The average precipitation was 3.93, or 0.05 below normal; the greatest monthly amount, 7.40, occurred at Ripley, and the least, 1.83, at New Paris.—*H. W. Richardson.*

Oklahoma.—The mean temperature was 67.1°; the highest was 95°, at Alva on the 25th, and the lowest, 36°, at Ponca City on the 6th, and at Prudence on the 1st. The average precipitation was 5.20; the greatest monthly amount, 8.80, occurred at Arapaho, and the least, 0.26, at Wagoner.—*J. I. Widmeyer.*

Oregon.—The mean temperature was 59.4°, or 3.6° above normal; the highest was 106°, at Vernonia on the 12th, and the lowest, 16°, at Silverlake on the 7th. The average precipitation was 1.29, or 0.89 below normal; the greatest monthly amount, 2.88, occurred at Government Camp, while none fell at Canyon City.—*B. S. Pague.*

Pennsylvania.—The mean temperature was 57.7°, or 1.1° below normal; the highest was 88°, at Lockhaven on the 9th, and the lowest, 25°, at Dushore and Shinglehouse on the 8th. The average precipitation was 5.24, or 0.25 above normal; the greatest monthly amount, 10.05, occurred at Smiths Corners, and the least, 1.71, at Brookville.—*T. F. Townsend.*

South Carolina.—The mean temperature was 69.3°, or 1.5° below normal; the highest was 97°, at Gillisonville on the 29th, and the lowest, 38°, at Cheraw on the 3d. The average precipitation was 2.39, or 1.63 below normal; the greatest monthly amount, 5.17, occurred at St. Stephen, and the least, 0.88, at St. George.—*J. W. Bauer.*

South Dakota.—The mean temperature was 58.0°, or 2.0° below normal; the highest was 97°, at Nowlin on the 18th, and the lowest, 19°, at Rosebud on the 14th. The average precipitation was 1.11, or 2.00 below normal; the greatest monthly amount, 4.97, occurred at Wentworth, and the least, trace, at Cherry Creek.—*S. W. Glenn.*

Tennessee.—The mean temperature was 63.5°, or 2.6° below normal; the highest was 94°, at Arlington on the 28th, and the lowest, 30°, at Hohenwald on the 2d. The average precipitation was 2.82, or 1.14 below normal; the greatest monthly amount, 6.89, occurred at Decatur, and the least, 0.10, at Sewanee.—*H. C. Bate.*

Texas.—The mean temperature for the State was 0.9° below the normal. There was a general deficiency, except over the central and western portions of north Texas, west Texas, and the southern portion of central Texas, where there was an excess ranging from 0.2° to 2.2°, with the greatest excess in the vicinity of Burnet. The deficiency ranged from 0.1° to 2.5° over east Texas, the panhandle, and the eastern portion of north Texas; from 0.2° to 3.7° over southwest Texas and the north and central portions of central Texas, and from 0.1° to 4.4° over the coast district, with the greatest deficiency in the vicinity of Fort McIntosh. The highest was 100°, at Midland on the 22d, and the lowest, 36°, at Midland on the 15th. The average precipitation for the State was 0.17 above the normal. There was a general excess ranging from 0.54 to 4.25 over the western portion of southwest Texas and the coast district and over central Texas, and from 0.76 to 5.06 over the panhandle and the central and eastern portions of north Texas, with the greatest excess in the vicinity of Forestburg. Over the other portions of the State there was a general deficiency ranging from 0.29 to 2.49 over east Texas and the central portion of north Texas, and from 0.10 to 2.56 over the eastern portion of the coast district and southwest Texas, and there was a slight deficiency over west Texas. The greatest local deficiency was 2.56 in the vicinity of Galveston. The greatest monthly amount, 9.39, occurred at Forestburg, and the lowest, 0.20, at Point Isabel.—*I. M. Cline.*

Utah.—The mean temperature was 60.1°; the highest was 104°, at St. George on the 29th, and the lowest, 12°, at Soldier Summit on the 7th. The average precipitation was 0.42; the greatest monthly amount, 1.31, occurred at Alpine, and the least, trace, at Manti.—*J. H. Smith.*

Virginia.—The mean temperature was 61.3°, or 4.2° below normal; the highest was 91°, at Guinea on the 17th, and the lowest, 18°, at Hot Springs on the 3d. The average precipitation was 4.15, or 0.29 below normal; the greatest monthly amount, 7.04, occurred at Monterey, and the least, 2.46, at Bonair.—*E. A. Evans.*

Washington.—The mean temperature was 59.0°, or 4.0° above normal; the highest was 102°, at Bridgeport on the 28th, and the lowest, 26°, at Hunters on the 7th. The average precipitation was 1.62, or 0.84 below normal; the greatest monthly amount, 7.51, occurred at West Ferndale, and the least, 0.10, at Bridgeport.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 57.6°, or about 4° below normal; the highest was 90°, at New Martinsville on the 8th, and the lowest, 23°, at Philippi on the 3d. The average precipitation was 4.60, or 0.50 above normal; the greatest monthly amount, 7.06, occurred at Marlinton, and the least, 2.17, at Wheeling.—*H. L. Ball.*

Wisconsin.—The mean temperature was 54.2°, or 2.1° below normal; the highest was 93°, at Osceola Mills on the 7th, and the lowest, 14°, at Spooner on the 1st. The average precipitation was 1.82, or 1.98 below normal; the greatest monthly amount, 5.27, occurred at Citypoint, and the least, 0.51, at Madison.—*W. M. Wilson.*

Wyoming.—The mean temperature was 57.5°, or 8.0° above normal; the highest was 92°, at Carbon on the 24th and at Lusk on the 18th; the lowest was 23°, at Fort Yellowstone and Lusk on the 8th and at Green River on the 9th. The average precipitation was 1.23, or 0.65 below normal; the greatest monthly amount, 3.07, occurred at Cheyenne, and the least, trace, at Wamsutter.—*M. G. Renoe.*

RIVER AND FLOOD SERVICE.

By PARK MORRILL, Forecast Official, in charge of River and Flood Service.

The month of May has brought the subsidence of the Mississippi flood. At points above the mouth of the Arkansas there was a steady fall in the river to stages as low or a little lower than usual at this season. The return of crevasse water to the river at lower points maintained high water longer. At Vicksburg the water fell slowly all the month, but was still 3 feet above danger line at its close. The crest of the flood did not reach New Orleans until the 8th, when the maximum stage of 19.6 feet was reached, and continued to the 11th. Later there was a slow fall to a stage of 18.2 feet at the end of May, which was 2 feet above danger line.

The highest and lowest water, mean stage, and monthly range at 119 river stations are given in the accompanying table. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Cairo, Memphis, and Vicksburg, on the Mississippi; Cincinnati, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.

The following résumé of river stages and conditions of navigation in the respective streams is compiled from reports by the officials of the Weather Bureau at various river stations and section centers:

Hudson River. (Reported by A. F. Sims, Albany, N. Y.)—The stage of water in the Hudson was normal up to the 7th, when a 7-foot freshet occurred.

Early on the morning of the 6th a serious break occurred in the Champlain Canal at the level below the two locks at Waterford; about 300 feet of the embankment was carried away, releasing the water let in on Monday and submerging adjacent fields. The Superintendent of Canals of the State of New York declared the canals open at noon of the 8th, and a half hour later boats were locked and hurried through. The Watervliet level presented an active scene; for several days the level was filled from Lock No. 3 to the Jones Car Company's works. The State basin was also jammed with the clumsy flotilla. There were 313 boats in the level, basin, slips, and river at the canal outlets in Watervliet.

The opening of navigation on the Champlain Canal was delayed until the 10th on account of leaks discovered 2 miles south of Fort Ann, necessitating the drawing of the water from the 12-mile level to make repairs. At noon of the 10th 350 of the fleet of westward moving canal boats had passed the weigh lock at Watervliet, or had taken out clearance papers. The breaks in the Champlain Canal necessarily delayed traffic on that branch, but a large number of boats took clearance papers for Whitehall in order to be ready. Most of the boats were empty and bound for Buffalo. It has seldom occurred that so many boats have passed the Watervliet weigh lock in so short a time.

At midnight of the 11th about 125 feet of the bank of the Champlain Canal gave way. The break was between Waterford and Mechanicsville; it was caused by quicksand.

The bad weather which prevailed during the first and second decades of the month has decreased the business of towing lines fully two-thirds below that of former years. Heretofore the ice companies have been engaged in forwarding many barges, but there has been very little demand for ice this year at New York, and in consequence little has been forwarded.

The rain of the 13th resulted in a 6-foot freshet in the Hudson, and caused market gardeners much anxiety. On the 15th the Hudson was 8 feet above mean low water. The color of the water flowing in the river at Albany pointed to heavy rainfall in the Schoharie Valley. On the 16th the river was very turbid, and dredging operations were suspended on account of high water; it became normal on the 18th.

The mountains in the eastern part of the Adirondack watershed were covered with snow on the morning of the 26th. Copious and frequent rains on the watershed in the eastern part of the State increased the volume of water flowing past Albany, and caused the Hoosic River to overflow its banks. All the tributary lakes and streams of the upper Hudson were very high during the third decade of the month.

Susquehanna River and branches. (Reported by E. R. Demain, Harrisburg, Pa.)—Heavy rains at the beginning of the month caused a general and in some streams a very decided rise in the waters, and these high stages were maintained by subsequent rains throughout the whole month. The average stage of the river at Harrisburg was nearly three times as great as during May, 1896, and it is believed the same could be said for the Susquehanna River system as a whole.

No floods of importance occurred except in the Juniata and its tributaries. The rain on the 1st and 2d of May caused a rise of 6.3 feet at Huntingdon between 8 a. m. of the 1st and 4:30 p. m. of the 2d, when the river reached a height of 10.1 feet. The rainfall was heaviest over the section drained by the Raystown branch of the Juniata, and considerable damage was sustained by farmers in the destruction of growing crops, fences, buildings, etc., by the flood of the 2d. The Juniata at Mifflin rose 7 feet between 8 a. m. of the 2d and 8 a. m. of the 3d, when it reached the maximum stage of the month, 12 feet. The greatest rise reported on the west branch of the Susquehanna occurred at Keating. On the 3d the river registered 7.7 feet, a rise of 7 feet in twenty-four hours.

In consequence of the breaks in the dam at Columbia, shad fishing has been carried on very successfully in the river at Harrisburg this season, and catches are reported as high up as the Juniata. Rapid progress has been made by the Pennsylvania Railroad Company on the new railroad bridge on the Susquehanna between Columbia and Wrightsville, and it was recently reported that the bridge will probably be so far advanced as to permit trains to pass over by June 7, 1897.

Rivers of South Atlantic States. (Reported by E. A. Evans, Richmond, Va.; C. F. von Herrmann, Raleigh, N. C.; L. N. Jesunofsky, Charleston, S. C.; D. Fisher, Augusta, Ga.; and J. B. Marbury, Atlanta, Ga.)—The James river was low during the entire month, there being only two rises, and those of an unimportant nature. At the beginning of the month the river was about the zero of the gauge but rising slowly, owing to moderate rains which had fallen over its basin. On the 4th and 5th 3.8 feet were recorded, after which the water receded slowly until the 14th, when it again rose to a maximum for the month of 7.4 feet, falling slowly thereafter until the close of the month. Neither of these rises caused any damage or apprehension, and no inconvenience beyond the muddying of the Richmond drinking water.

The stages of the rivers of North Carolina were generally low during the month. The precipitation throughout the month was moderate and the cultivated condition of the soil caused slow drainage to the streams and gradual rises. The heaviest rain occurred on the 1st, causing slightly higher stages from the 1st to the 4th, but not reaching within 20 feet of the danger lines on either the Cape Fear or the Roanoke. General rains from the 11th to the 16th caused another rise, culminating on the 16th, about equal to the first described. From that date the rivers slowly declined to the lowest stages at the end of the month. During the last decade of the month the floating of timber was interrupted, but navigation of the lower courses of the rivers was not interfered with.

No freshets occurred in the streams of South Carolina during May. The heavy rainfall over the eastern section of the State on the afternoon of April 30 and on May 1 did not raise the streams to any great extent. There was a 5-foot rise in the Wateree at Camden on the 4th, and a 6-foot rise in the Pedee at Cheraw on the 3d and 14th; other than these no decided rises were reported. Unusually low water was recorded during the last half of the month. The logging season was practically closed on all streams by the 10th. The Santee, the Wateree from St. Stephen to Camden, the Black, the Edisto, the Little Pedee, the Lynch, and the Congaree up to Granby Falls were navigable during the entire month. The Waccamaw was navigable from Winyah Bay to Conway from the 2d to the 28th. Navigation was suspended on the upper Pedee from a point 65 miles above Smiths Mills from the 22d to the 31st. Much freight is being held at Georgetown awaiting favorable steamboat water between Smiths Mills and Cheraw.

The changes in the Savannah River for the month are hardly worthy of comment; a moderately high stage prevailed during the first three days, caused by heavy but scattered showers falling in the up-river country and after this a steady fall was maintained, the entire range for the remaining 28 days being a little over 4 feet, while the 24-hour rise on the 2d was 8 feet. One of the regular line of boats was discontinued early in the month, leaving only two to accommodate river traffic, which at this season of the year reaches its minimum volume.

The month of May, 1897, was the driest during the past nineteen years in western Georgia, and, as a consequence, there was a general decline in the river stages throughout the month, and very low water prevails in Georgia rivers other than the Savannah.

Mobile River and branches. (Reported by F. P. Chaffee, Montgomery, Ala., and W. M. Dudley, Mobile, Ala.)—There was a gradual fall in the Alabama River and its tributaries during the entire month, except a slight recovery in the waters for a few days during the middle of the month, due to scattered rains; the Alabama is now so low as to stop traffic above Selma, except by boats of very light draught.

The Tombigbee River and its branches have also continued low throughout the month, there being but little general rain; the rain which fell was at long intervals, and, though heavy, covered such a short period of time that the rises caused thereby ceased as rapidly.

The rains of the 1st of the month caused slight rises at nearly all points to the 3d, when there was a general fall in all the streams to the 11th; the heavy rains of the 11th, 12th, and 13th caused much needed rises, and their effects were felt to the 18th, when the rivers began falling and so continued throughout the remainder of the month. Navigation was somewhat impeded up to the 10th, but the rains of the 11th to 13th, which caused the general rise, had the effect of giving good navigable stages to about the 25th.

Ohio River and branches. (Reported by F. Ridgway, Pittsburg, Pa.; H. L. Ball, Parkersburg, W. Va.; S. S. Bassler, Cincinnati, Ohio; F. Burke, Louisville, Ky.; and P. H. Smyth, Cairo, Ill.)—The upper Ohio and its tributary rivers have been open to packet navigation during the entire month, although water became very low during the last week; the lowest stage at Pittsburg for the month, 2.4 feet, was recorded on the 30th. Freight and passenger traffic on the principal packet lines was a little above the average for this season of the year. The coal operators enjoyed barge-water stages from the 3d to the 8th, and again from the 13th to the 18th; the water rose to a coal-boat stage on the 14th, 15th, and 16th, when 67,948 tons of coal passed through the lock at Davis Island en route for the southern markets.

General and moderately heavy rains occurred throughout West Virginia during the first five days of the month. The rivers, which had been falling slowly during the latter part of April, began rising on the 2d. Except in some of the small streams, the rise was light and without interest. A second period of general rains, from the 11th to the 14th, again caused a moderate rise in the rivers of the interior. The Ohio at Parkersburg rose slowly from the 2d to the 5th, reaching a maximum stage of 14.7 feet on the 5th. The second and greatest rise continued from the 12th to the 16th, with a maximum stage of 18.7 feet. From that date until the close of the month all the rivers fell slowly. Throughout the month all navigable streams maintained good boating stages, but business was reported as light and dull.

Nothing of importance occurred in connection with the river at Cincinnati during the month, except a sudden rise in the Licking on the 12th, and in the Kanawha on the 14th and 15th, which rises had considerable effect on the Ohio at this point. The highest stage (35 feet) was reached at Cincinnati on the morning of the 17th; after that date the river continued falling uninterruptedly, and was at the end of the month at a comparatively low stage, with every prospect of falling still lower. Navigation has been good and river traffic active, but fears are now entertained of too low water for up-river navigation.

At Louisville a good stage of water for navigation was maintained throughout the month, especially from the 6th to the 22d, during which time moderate rains kept the river slightly above the average height. During the remainder of the month a nearly normal stage prevailed.

The river at Evansville was rising from the 2d to the 9th, and from the 14th to the 20th; during the remainder of the month it was falling. During the last decade of the month the fall amounted to 15.8 feet, bringing the stage down to 10.6 feet, which is the lowest it has been at Evansville in three months.

At Paducah and Cairo the river fell during most of the month. The changes, however, were generally slight, except during the latter part of the month, when a marked fall set in. The stage at Cairo at the close of the month was 14.7 feet lower than at its beginning. Large tows of coal passed Cairo, going south, on the 2d, 12th, 14th, 17th, and 30th. Seep water continued over the ungraded portions of Cairo until about the 12th, and at the close of the month there were still some few low bottoms that were under water.

Tennessee and Cumberland rivers. (Reported by L. M. Pindell, Chattanooga, Tenn., and H. C. Bate, Nashville, Tenn.)—The Tennessee River was navigable during the entire month. A slight rise occurred during the first part of the month, which gave a splendid boating tide. A rainy spell set in on the 9th and 10th, lasting from three to five days at the various stations. The rainfall on the 12th and 13th was heavy, ranging from 1 to 2.97 inches. This caused the river to rise rapidly, reaching a stage of 22.4 feet on the 15th at Chattanooga, 17.1 feet on the 16th at Bridgeport, 13.6 feet on the 17th at Florence, and 20.6 feet on the 18th at Riverton. The stage recorded at Chattanooga on the 15th was the highest ever observed in May, except in 1893, when the river reached 30 feet. The river rose 10.6 feet in the twenty-four hours ending at 8 a. m. on the 14th. The heavy rains which occurred on the 12th and 13th caused the Sequatchie River, Emory River, and Bear Creek to rise and overflow the surrounding country, doing considerable damage to growing crops. The Clinch River at the headwaters also overflowed its banks. The Tennessee fell during the last half of the month. At Bridgeport navigation was practically closed on the 28th.

The month opened with a favorable stage of water at all points on the Cumberland River, and so continued until the last week of the month. Navigation above Carthage closed about the 26th, and above Nashville two or three days later. Boats continue to run to points on the lower river, but the steady fall now in progress promises to close navigation on the Cumberland by the 10th or 15th of June.

Mississippi River and minor branches. (Reported by P. F. Lyons, St. Paul, Minn.; M. J. Wright, Jr., La Crosse, Wis.; G. E. Hunt, Davenport, Iowa; F. Z. Gosewisch, Keokuk, Iowa; H. C. Frankenfield, St. Louis, Mo.; P. H. Smyth, Cairo, Ill; S. C. Emery, Memphis, Tenn.; R. J. Hyatt, Vicksburg, Miss.; R. E. Kerkam, New Orleans, La.; and C. Davis, Shreveport, La.)—There are no marked features in the condition of the upper Mississippi for May. A navigable stage of water existed up to St. Paul. There was a gradual and nearly steady fall of 0.3 foot per day at the latter point up to the 12th, when it diminished to about 0.1 foot, evidently because of the moderate rains about that time. Heavier rains brought the river to a stand from the 17th to 22d; then there was a steady fall again to the end of the month. Rafting has progressed with great activity in the vicinity of La Crosse. The Government engineers resumed work on this portion of the river during the latter part of the month.

The beginning of the month found the river well below the danger line at stations south to Muscatine, except La Crosse and Le Claire, and slightly below at those places. A slight rise occurred at most of the stations during the last four or five days of the month. The close of the month found the gauge readings from 3 to 7 feet below those at the end of April. The lack of rain in the upper Mississippi Valley explains the continued fall of the river. At only one station (Dubuque) did the monthly precipitation amount to more than half the normal.

At Keokuk the river fell steadily throughout the entire month. At the beginning of the month a large area of farming lands was overflowed, but by the 5th the river had fallen below the danger line, and by the 15th most of the flooded lands were dry enough for plowing. The month closed with a good stage of water for navigation, the channel on the Des Moines rapids being still navigable.

From Keokuk to St. Louis the river was still above the danger line at the beginning of the month, but was falling north of the Illinois River. From Grafton to St. Louis the crest was reached on the 2d, the extreme stage having been 23.2 feet at Grafton, and 31 feet at St. Louis. No damage was done further than that reported during April. The water went over the railroad tracks along the levee at St. Louis, but no serious inconvenience resulted. The fall commenced from Grafton southward on the 2d, and on the 5th the river at St. Louis was once more below the danger line. The fall continued throughout the month above the mouth of the Missouri, the water going below the danger lines at Keokuk and Hannibal on the 5th, and at Louisiana on the 10th. On the 3d the St. Louis, Keokuk and Northwestern Railroad resumed the use of its tracks from Quincy northward. The decline was particularly rapid at St. Louis, amounting to nearly 16 feet from the 2d to the 25th, when a slow rise commenced, due to local rains over the Missouri watershed within the State of Missouri. The rise continued until the 30th. The month closed with 16 feet of water on the gauge.

The Illinois River fell steadily throughout the entire month.

From St. Louis to Cairo the Mississippi was falling nearly the entire month. Immediately below Cairo slight rises were in progress from the 1st to the 4th and from the 16th to the 21st. The farm lands along the river between Cairo and Memphis, which a month ago were under water, have been plowed up and planted, mostly in corn. Many of the fields planted in corn during the month had on them, prior to the flood, fine wheat crops, which were drowned out and ruined by the high water.

On May 1 the river between Cairo and Memphis was generally within its banks; at the latter place it had fallen below the danger line, although the low banks on the Arkansas side were still covered with water and but little land was visible in that direction from the Memphis bluff until the 10th of the month. The decline at Helena was less rapid than at points above, owing to the continued high stage of the St. Francis, and the river at that place remained above the danger line until the 5th. After the 10th the decline became more decided, but was checked on the 20th, by water from the upper Mississippi, which caused a rise of nearly one foot at Memphis, and at Helena the river beame stationary on the 25th. From that time to the end of the month the daily fall was from 1 to 1.5 foot. The total decline in the river at Memphis was 15 feet, bringing the stage below that of the corresponding date in 1896. During the first decade of the month boats experienced some trouble in making landings, owing to the high water. Gauge readings were resumed on the Beal street gauge on the 30th instant, the water having become so low as to cut off the elevator gauge from the river.

Between Memphis and Vicksburg streams were high the 1st of May, but they fell steadily during the month to stages below the danger line at all points, except Vicksburg and Yazoo City. No unfavorable conditions occurred and a general improvement was noted all along the line. The overflowed districts were uncovered by the rapid decline in the rivers; the crevasses were closed and planting progressed as the water fell. The flood refugees returned to the plantations and stock was reshipped to the lowlands as fast as the water receded. The relief stations opened by the General and State governments were closed and conditions were more hopeful in all quarters for raising a crop. The railroads resumed operations west, but through travel was still interrupted north and south over Yazoo and Mississippi Valley Rail-

road, although repairs were being pushed with vigor. Mills and factories that had been idle for some time opened up again and new life and energy were imparted to all business in this section. The deposit left by the overflow has enriched the lands, and cotton planted on these lands since the overflow is doing well.

A slight decline set in below Vicksburg during the early days of the month, affecting Natchez but very slightly during the first ten days, after which a fall set in that continued to the close of the month. The river continued rising at Bayou Sara and Donaldsonville until the middle of the month, and remained nearly stationary at New Orleans until the 17th, after which there was a general decline. The fall was 4 feet at Natchez, 2.5 feet at Bayou Sara, 2 feet at Donaldsonville, and 1.5 foot at New Orleans by the close of the month.

On the 1st of the month the crevasse waters from above were approaching the Atchafalaya district; on the 2d the water was higher in Tensas Parish than in the flood of 1893. A break occurred in the levee at Angola plantation, opposite the mouth of Red River, in West Feliciana Parish at 11.30 a. m. of the 2d, and flooded about 6,000 acres of ground. By the 5th some planters were bringing back stock and preparing to replant lands in portions of Concordia Parish, the backwater falling slightly from Concordia northward. A small break occurred in the lower portion of Baton Rouge on the 8th, but was closed before any serious damage was done. On the 9th four breaks occurred in the ten-mile levee along Bayou des Glaises, aggregating a width of about 800 feet. On the 10th a small break occurred in the lower portion of Baton Rouge, followed by a second break on the 11th, which was closed, and a third on the 12th that was also closed. A "box" levee was built along the entire weak stretch that was completed by the 20th. On the 30th a break occurred at Conrad Point, about 8 miles by river below Baton Rouge and had widened to nearly 300 feet by the close of the month. This is the worst break that has occurred in that vicinity, but will probably be closed, since men and material in plenty have been shipped to that point.

There was a general decline in the Red River during the first half of the month, except in the upper portion, where heavy local rains caused a rise of about 16 feet at Arthur City on the 10th to 14th, followed by an 18-foot rise at Fulton, and a later rise in the lower river. The upper river declined after the middle of the month. There was sufficient water for navigation during the month. The gauge at Fulton was within 2 feet of the danger line (28 feet) on the 17th, but the lower stream was affected to a much less extent, Shreveport's maximum reading being only 15.1 feet.

The Ouachita declined steadily during the entire month, the lower river continuing at a navigable stage.

Missouri River and branches. (Reported by L. A. Welsh, Omaha, Nebr., and P. Connor, Kansas City, Mo.)—The Missouri River above Kansas City continued falling steadily during the first half of the month; from the middle to the close of the month the stage of water varied. A marked rise was noted during the last few days of the month and reports from the upper river were to the effect that the snow in the mountains was melting and that the "June rise" was on. These reports caused considerable uneasiness along the river, but proved to be unfounded. The rise was undoubtedly due to heavy rains, with possibly some snow water added. The condition of the extreme upper river, at the close of the month, was such that there was no fear of a return of high water. Reports received subsequent to the recent high stage of water substantiates the statement previously made that the damage caused by the spring flood was light. The east bank of the Missouri at Plattsmouth is cutting badly, and the Burlington and Missouri River Railroad Company is doing riprap work there, which is checking the cutting to some extent, but is not stopping it entirely.

The general tendency of the Missouri river at Kansas City was downward all the month. It was 0.7 foot below danger line on the 1st; on the 31st it was 6.8 feet below, with slight undulations in the meantime. The action of the swift current and falling river caused considerable cutting of the banks. About 6 miles east of this city the bank was cut away to the Kansas City and Independence Air Line Railroad and stopped the running of trains for several hours on the afternoon of the 2d, until the tracks could be moved back from the river. The Missouri, below Kansas City, fell until the 22d, when a slow rise commenced, due to local rains, which lasted about five days.

Arkansas River. (Reported by J. J. O'Donnell, Fort Smith, Ark., and F. H. Clarke, Little Rock, Ark.)—The upper Arkansas River fell steadily from the 1st to the 9th, then rose until the 13th, when the gauge at Fort Smith read 14.5 feet, and afterward fell until the end of the month, the average daily gauge reading being 10.1 feet. Navigation continued during the month.

A good boating stage prevailed in the lower Arkansas River throughout the month, there being no interruption to navigation from any cause. There were no floods, the river not even approaching the danger line at any station. The rise in the upper river at the end of April brought down light drift wood that collected in sufficient quantities against the false work of the bridge in course of construction across the river at Little Rock to carry away part of it and delay the work of construction several days. The rise in the lower river on the 2d and 3d was evidently from the Canadian River, the red color of the water being a sure index of the locality from which it came. At the close of the month a slight swell appeared in the upper river; the lower river continued declining, but still has fully 3 feet more water than is necessary for a good boating stage.

Rivers on the Pacific Coast. (Reported by W. H. Hammon, San Francisco, Cal.; J. A. Barwick, Sacramento, Cal.; and B. S. Pague, Portland, Oreg.)—No floods occurred during May on the Sacramento and San Joaquin rivers. Toward the close of the month the warm weather caused a rapid melting of mountain snow and the rivers increased in volume. On the afternoon of the 23d the levees broke at the Madera, Whitney, and Kerr ranches. On May 30 and 31, owing to high winds, the levees around Union Island in the San Joaquin River north of Tracy were endangered, and it was necessary in places to put in bulkheads to protect them, but with the subsidence of the wind the danger passed.

The Sacramento reached a point during the last few days of the month which caused the drainage of the overflowed tule basins in Yolo and Sutter counties through the numerous sloughs and breaks leading into the river and the cultivatable lands, as they are being drained, are put into a good state of tilth for planting crops which mature late. The prospect for a large acreage being planted is much better than for years past.

During the month the Columbia River rose to a height that usually obtains in the month of June, and caused the Willamette River to back up in the city of Portland, resulting in a stage of 23.7 feet on the 24th. At this height the lower docks are all covered and water enters the cellars on Front, First, and Second streets, and some of the deeper cellars on Third Street. At The Dalles the river rose to a height of 42.7 feet on the 24th, and at that city the docks were covered. The Columbia flooded most of the islands in the river and much of the lowland. Water of this height occurs almost every year, but usually during the month of June. On the overflowed land, which is principally used for hay and potatoes, excellent crops are grown after the water goes down. Potatoes planted on this land as late as the middle of July yield from 300 to 500 bushels to the acre.

Heights of rivers above zeros of gauges, May, 1897.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Mississippi River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Paul, Minn.	1,957	14	10.0	1	5.3	30, 31	7.0	4.7
Reeds Landing, Minn.	1,887	12	8.0	1	4.8	21	5.8	3.2
La Crosse, Wis.	1,822	10	9.8	1	6.3	18	7.7	3.5
North McGregor, Iowa	1,762	18	12.4	1	6.6	23–25	8.8	5.8
Dubuque, Iowa	1,702	15	13.2	1	6.4	25, 26	9.1	6.8
Leclaire, Iowa	1,612	10	9.5	1	4.3	27	6.3	5.2
Davenport, Iowa	1,596	15	12.3	1	5.4	26–29	7.9	6.9
Keokuk, Iowa	1,466	14	16.2	1	5.5	30, 31	9.5	10.7
Hannibal, Mo	1,405	17	19.6	1	6.8	31	11.6	12.8
Grafton, Ill	1,307	23	23.2	2	8.9	31	15.2	14.3
St. Louis, Mo.	1,264	30	31.0	2	15.2	25	21.7	15.8
Chester, Ill. †	1,189	30	26.1	3	11.6	25, 26	17.3	14.5
Cairo, Ill	1,073	40	37.6	4	22.3	31	33.3	15.3
Memphis, Tenn	843	33	33.2	1	18.1	31	26.9	15.1
Helena, Ark	767	44	45.4	1	28.5	31	39.3	16.9
Arkansas City, Ark	635	42	48.2	1	35.8	31	44.1	12.4
Greenville, Miss	595	40	42.5	1	31.2	31	38.7	11.3
Vicksburg, Miss	474	41	51.9	1	44.2	31	49.2	7.7
New Orleans, La	108	16	19.6	8, 9, 11	18.2	31	19.1	1.3
Arkansas River.								
Fort Smith, Ark.	345	22	17.3	1	5.6	28	10.1	11.7
Dardanelle, Ark.	250	21	16.5	2	4.7	29, 30	9.7	11.8
Little Rock, Ark.	170	23	17.8	3	6.8	31	11.6	11.0
White River.								
Newport, Ark	150	21	17.1	1	4.1	29-31	8.9	13.0
Illinois River.								
Peoria, Ill	135	14	11.5	1	6.9	31	9.2	4.6
Missouri River.								
Bismarck, N. Dak.	1,201	14	9.1	27, 28	4.7	4, 5	6.6	4.4
Pierre, S. Dak.	1,006	14	8.7	30	5.0	9	6.6	3.7
Sioux City, Iowa	676	19	12.1	31	8.4	12, 13, 15	9.8	3.7
Omaha, Nebr.	561	18	12.0	31	9.4	14, 15	10.5	2.6
St. Joseph, Mo.	373	10	9.3	1	6.2	17	7.2	3.1
Kansas City, Mo.	280	21	20.3	1	12.8	18, 19	14.6	7.5
Boonville, Mo.	191	20	19.6	1	10.6	21, 22	13.0	9.0
Hermann, Mo.	95	21	15.8	1	6.8	21–23	9.5	9.0
Ohio River.								
Pittsburg, Pa	966	22	14.7	15	2.4	30	3.3	12.3
Davis Island Dam, Pa.	960	25	14.1	15	4.1	31	7.7	10.0
Wheeling, W. Va.	875	36	18.8	16	4.9	31	9.5	13.9
Marietta, Ohio	795	25	18.5	16	5.7	31	10.5	12.8
Parkersburg, W. Va.	785	35	18.7	16	6.4	31	11.2	12.3
Point Pleasant, W. Va.	703	36	28.0	15	5.4	31	13.9	22.6
Catlettsburg, Ky	651	50	33.7	15	7.5	31	18.2	26.2
Portsmouth, Ohio	612	50	34.0	16	9.2	31	19.7	24.8
Cincinnati, Ohio	499	45	35.0	17	12.0	31	23.1	23.0
Louisville, Ky.	367	24	12.2	18	6.2	30, 31	9.2	6.0
Evansville, Ind	184	30	26.4	20	10.6	31	19.7	15.8
Mount Vernon, Ind. ‡	148	35	25.5	20, 21	11.0	31	20.7	14.5
Paducah, Ky.	47	40	27.9	21	11.8	31	22.6	16.1
Alleghany River.								
Warren, Pa	177	7	5.0	13	0.5	31	2.2	4.5
Oil City, Pa	123	13	5.7	14	1.7	31	3.1	4.0
Parkers Landing, Pa.	73	20	6.6	14	1.3	31	3.2	5.3
Freeport, Pa.	26	20	11.0	14	2.8	31	5.9	8.2
Conemaugh River.								
Johnstown, Pa.	64	7	6.3	2	1.2	31	2.3	5.1

Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Red Bank Creek.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Brookville, Pa	35	8	0.4	4	—0.9	29-31	—0.5	1.3
Beaver River.								
Ellwood Junction, Pa	10	14	3.3	2	0.4	31	1.5	2.9
Big Sandy River.								
Louisa, Ky	26	20	20.1	15	4.4	31	8.2	15.7
Cumberland River.								
Burnside, Ky	434	50	37.4	14	1.8	31	9.2	35.6
Carthage, Tenn	257	30	26.3	16	2.8	31	10.2	23.5
Nashville, Tenn	175	40	28.2	18	4.4	31	13.6	23.8
Great Kanawha River.								
Charleston, W. Va	61	30	21.0	14	4.7	25,26	7.2	16.3
New River.								
Radford, Va	153	14	2.0	14	0.5	29,30	0.9	1.5
Hinton, W. Va	95	14	9.8	14	1.9	30,31	3.2	7.9
Licking River.								
Falmouth, Ky	30	25	16.4	12	1.7	31	5.6	14.7
Miami River.								
Dayton, Ohio	69	18	4.6	3	2.0	31	2.9	2.6
Monongahela River.								
Weston, W. Va	161	18	......	......	......	......	......	......
Fairmont, W. Va	119	25	15.1	14	0.6	31	3.1	14.5
Morgantown, W. Va	95	20	18.2	14	7.2	30,31	9.1	11.0
Greensboro, Pa	81	18	17.0	14	7.6	1,25-31	9.4	9.4
Lock No. 4, Pa	40	28	20.6	15	6.6	31	9.8	14.0
Cheat River.								
Rowlesburg, W. Va	36	14	7.0	3,14	2.0	1,10,11	4.3	5.0
Youghiogheny River.								
Confluence, Pa	59	10	5.5	2	1.0	31	2.8	4.5
West Newton, Pa	15	23	6.4	3	0.9	30,31	2.5	5.5
Tennessee River.								
Knoxville, Tenn	614	29	......	......	......	......	......	......
Rockwood, Tenn	519	20	......	......	......	......	......	......
Chattanooga, Tenn	430	33	22.4	15	4.1	30	8.3	18.3
Bridgeport, Ala	390	24	17.1	16	2.5	31	6.4	14.6
Florence, Ala	220	16	13.6	17,18	2.7	30,31	6.3	10.9
Johnsonville, Tenn	94	21	19.5	19,20	4.8	31	10.1	14.7
Wabash River.								
Terre Haute, Ind	165	16	9.2	14	2.8	31	5.5	6.4
Mt. Carmel, Ill	50	15	10.4	16	5.0	31	7.7	5.4
Red River								
Arthur City, Tex	688	27	21.9	14	5.2	10	11.8	16.7
Fulton, Ark	565	28	26.0	17	6.8	11	14.9	19.2
Shreveport, La	449	29	15.1	25-27	8.1	14	12.2	7.0
Alexandria, La	139	33	20.5	1	15.7	17	17.6	4.8
Atchafalaya River.								
Melville, La	100*	31	36.1	15	35.2	30,31	35.8	0.9
Ouachita River.								
Camden, Ark	340	39	8.4	1	4.3	29-31	6.0	4.1
Monroe, La	100	40	35.5	1	28.4	31	31.8	7.1
Yazoo River.								
Yazoo City, Miss	80	25	31.5	1,2	27.6	31	30.0	3.9
Tombigbee River.								
Columbus, Miss	285	33	6.8	16	—1.6	31	2.3	8.4
Demopolis, Ala	155	35	19.2	17	1.5	31	9.0	17.7
Black Warrior River.								
Cordova, Ala	155	20	7.1	13	2.0	31	3.5	5.1
Tuscaloosa, Ala	90	38	20.5	15	2.0	31	6.9	18.5
Alabama River.								
Montgomery, Ala	265	35	8.3	2	1.8	31	4.0	6.5
Selma, Ala	212	35	11.0	3	2.6	31	6.1	8.4

Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Coosa River.	*Miles*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Rome, Ga	225	30	5.0	15	1.9	30,31	2.9	3.1
Wilsonville, Ala	66	15	3.9	17	2.7	30,31	3.3	1.2
Tallapoosa River.								
Sturdevant, Ala	69	15	2.3	1	0.7	31	1.4	1.6
Savannah River.								
Augusta, Ga	130	32	16.9	2	6.8	28,29,31	8.7	10.1
Edisto River.								
Edisto, S. C	75	6	4.2	8	1.5	31	3.1	2.7
Congaree River.								
Columbia, S. C	37	15	3.4	4	1.3	7,8	1.7	2.1
Santee River.								
St. Stephens, S. C	50	12	7.3	10	3.5	31	6.2	3.8
Wateree River.								
Camden, S. C	45	24	11.8	15	4.8	29	7.2	7.0
Black River.								
Kingstree, S. C	60	12	7.9	17	4.7	31	6.9	3.2
Pedee River.								
Cheraw, S. C	145	27	14.9	3	2.4	31	5.3	12.5
Lynch Creek.								
Effingham, S. C	35	12	9.3	9,10	3.5	27,28	5.8	5.8
Lumber River.								
Fair Bluff, N. C	10	6	4.5	8	1.0	31	3.2	3.5
Waccamaw River.								
Conway, S. C	40	7	4.0	18	2.2	31	3.3	1.8
Cape Fear River.								
Fayetteville, N. C	100	38	17.4	15	4.0	29	7.0	13.4
James River.								
Lynchburg, Va	257	18	10.4	14	0.9	31	2.7	9.5
Richmond, Va	110	12	7.4	16	0.1	1,31	1.6	7.3
Potomac River.								
Harpers Ferry, W. Va	170	16	11.7	15	1.5	1	5.4	10.2
Susquehanna River.								
Wilkesbarre, Pa	178	14	......	......	......	......	......	......
Harrisburg, Pa	70	17	7.9	16	3.1	1,2	5.0	4.8
W. Br. of Susquehanna.								
Lock Haven, Pa	63	10	4.5	4	1.0	30,31	2.2	3.5
Williamsport, Pa	35	20	8.8	4	2.0	31	4.9	6.8
Juniata River.								
Huntingdon, Pa	80	24	7.2	3	3.5	30,31	4.4	3.7
Sacramento River.								
Redbluff, Cal	241	23	6.9	3	3.7	28-31	4.8	3.2
Sacramento, Cal	70	28	22.5	7	19.6	30,31	21.3	2.9
Willamette River.								
Eugene, Oreg	149	10	5.2	14,15	3.2	29	4.3	2.0
Albany, Oreg	99	20	6.0	7,14-16	3.8	29	5.1	2.2
Salem, Oreg	69	20	6.2	14,15	3.7	31	5.3	2.5
Portland, Oreg	10	15	23.7	24,25	15.8	5	20.1	7.9

Late reports, April, 1897.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Eugene, Oreg	149	10	8.0	10,17,18	4.4	30	6.4	3.6
Albany, Oreg	99	20	11.2	8	6.0	30	9.0	5.2
Salem, Oreg	69	20	11.6	20	6.4	30	9.5	5.2

* Distance to the Gulf of Mexico.
† Record for 30 days.
‡ Record for 24 days.

SPECIAL CONTRIBUTIONS.

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Massachusetts.—Means, James. The Aeronautical Annual for 1897. Boston, 1897. 8vo. 176 pp. 18 pls. and 1 diagram.

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CLOTHING AND TEMPERATURE.

W. F. R. PHILLIPS, M. D., in charge of Section of Climatology, U. S. Weather Bureau.

To acquire some concrete idea of the influence of general meteorological conditions upon personal comfort and upon the efficiency of clothing in different conditions of weather, the writer undertook a series of observations of the temperature of certain parts of the clothing and of the body.

The series comprised observations of temperature between the coat and vest, the vest and linen shirt, the linen shirt and woolen undershirt, the undershirt and skin, and the temperature of the body under the tongue.

The series may, for convenience, be subdivided into four sets or subseries: 1st, a set of observations made indoors; 2d, a set made after free exposure out of doors for ten minutes; 3d, a set made after free exposure out of doors for twenty minutes; 4th, a set made ten minutes after returning indoors. All observations were made in the shade; the first and fourth sets in a room in the Weather Bureau building, and the second and third in the shade of the same building, and in situations so chosen as not to interfere with the free movement of the wind.

The thermometers were in position for ten minutes before the readings were recorded for the first set, and the readings for the other sets were made at the consecutive ten, twenty, and thirty minute periods thereafter.

The period of the day selected for the series was that between 1:50 and 2:30 p. m. This period was selected in order that the outdoor sets might coincide approximately with the 2 p. m. local meteorological observation made by the Weather Bureau in this city (Washington).

The first observations of the series were made on February 4, and the last on February 16, 1897, eleven days in all. The continuity of the record of the temperature of the body in the mouth was broken by an injury to the clinical thermometer on February 11; a new one was obtained and used on February 16. The series was terminated sooner than contemplated by an attack of bronchitis, rendering it imprudent to continue the personal exposure involved in the prosecution of the observations in cold air.

The clothing worn during the series consisted of a serge coat and vest, a linen shirt, and woolen undershirt. This weight of clothing was very comfortable while indoors, and with the addition of an overcoat was ample for outdoors, but while making the observation no overcoat or additional clothing was worn. The coat and vest were single lined with a light-weight material, the linen shirt of the usual quality, and the woolen undershirt of the material known as fleece-lined flannel.

The following are the average values of each of the subseries, and also the average of the 2 p. m. local meteorological observation. The details of each are shown in the appended table.

Details of observations of bodily temperature and that of clothing, etc.

	February, 1897.											Average.
	4	5	6	8	9	10	11	12	13	15	16	
First set. Indoors:												
Temperature—												
of room	79.1	77.8	78.0	73.0	78.0	75.5	78.0	75.0	76.5	75.0	76.0	76.5
body	98.7	98.4	98.5	98.4	98.4	98.3	....	....	....	....	98.5	98.5
between undershirt and skin	95.0	96.0	96.2	95.5	95.6	95.8	94.2	96.5	95.4	95.0	95.2	95.5
linen shirt and undershirt	92.8	89.0	90.0	88.5	89.3	90.3	93.0	92.3	88.5	91.3	88.0	90.3
vest and linen shirt	90.7	86.5	88.2	85.5	86.4	86.8	87.2	88.8	87.5	86.3	85.5	87.4
coat and vest	89.6	84.5	86.0	83.0	83.2	84.8	85.2	86.0	83.8	83.6	84.2	84.9
Second set. Outdoors ten minutes:												
Temperature—												
of body	98.4	98.2	98.2	98.3	98.3	98.2	....	....	....	....	98.4	98.3
between undershirt and skin	94.6	93.0	95.2	93.8	93.0	94.8	92.2	94.8	93.8	94.3	92.2	93.8
linen shirt and undershirt	82.2	80.0	82.0	81.0	78.7	81.4	81.3	81.8	79.0	87.2	80.5	81.3
vest and linen shirt	71.5	71.2	76.4	78.6	71.4	76.0	70.0	77.0	73.0	80.6	74.5	74.6
coat and vest	63.0	62.8	70.2	68.0	59.0	66.7	60.0	65.2	62.5	74.5	66.5	65.3
Third set. Outdoors twenty minutes:												
Temperature—												
of body	98.0	98.0	98.1	98.1	98.0	97.8	....	....	....	....	98.0	98.0
between undershirt and skin	92.3	91.8	94.0	93.2	92.2	94.0	90.6	94.4	92.2	93.5	90.0	92.6
linen shirt and undershirt	77.9	78.0	79.0	76.7	76.7	77.0	78.6	76.3	78.3	84.5	76.0	78.1
vest and linen shirt	65.2	67.2	77.4	73.3	67.0	69.0	64.3	69.5	72.2	78.0	67.8	68.7
coat and vest	57.5	60.0	66.8	62.0	56.6	61.4	55.5	61.5	59.4	71.0	60.6	61.1
Fourth set. Ten minutes after returning indoors:												
Temperature—												
of room	73.3	77.0	77.4	73.0	77.0	75.0	74.0	76.5	74.8	75.7	75.0	75.7
body	98.0	97.9	98.1	98.1	....	97.7	....	....	....	....	97.9	98.0
between undershirt and skin	94.0	92.0	95.0	93.6	93.0	94.6	90.8	94.6	92.2	93.3	91.0	93.1
linen shirt and undershirt	90.4	86.5	88.0	85.5	82.2	87.0	87.0	85.0	84.8	88.2	83.5	86.3
vest and linen shirt	85.3	79.3	83.7	81.3	76.0	82.7	77.3	79.8	82.5	83.0	78.5	80.8
coat and vest	82.8	75.5	81.0	77.4	73.2	80.0	75.2	77.0	78.8	79.5	76.5	77.9
2 p. m. meteorological observation:												
Dry thermometer	37.8	35.0	51.0	34.2	37.0	37.2	33.2	32.6	41.0	50.5	43.2	39.3
Wet thermometer	31.0	32.0	50.0	34.0	33.0	33.7	31.2	32.1	37.0	45.0	37.0	36.0
Relative humidity (per cent)	44	72	93	98	65	69	80	95	68	65	55	73
Absolute humidity (grains per cubic foot)	1.19	1.74	3.95	2.24	1.67	1.75	1.82	2.00	2.05	2.70	1.82	2.08
Velocity of wind (miles per hour)	9	10	15	2	14	3	8	5	5	6	14	8.3
Subjective sensation:												
Indoors	Very warm; slight perspiration.	Warm.	Warm and dry.	Comfortable.	Very warm; slight perspiration.	Warm.	Very warm.	Warm.	....	....	....	....
Outdoors	Cold; fingers painful.	Cold as preceding day.	Cold, but not unpleasant.	Cold and chilly.	Cold, but not chilly.	Cool, agreeable.	Cold and chilly.	Cold and chilly.	....	....	....	....

First set. Indoors. Average of eleven days.

	°F.
Temperature of room	76.5
Temperature between coat and vest	84.9
Temperature between vest and linen shirt	87.4
Temperature between linen shirt and woolen undershirt	90.3
Temperature between woolen undershirt and skin	95.5
Temperature under the tongue (average of six days)	98.5

Second set. Outdoors ten minutes. Average of eleven days.

Atmospheric temperature	39.3
Temperature between coat and vest	65.3
Temperature between vest and linen shirt	74.6
Temperature between linen shirt and woolen undershirt	81.3
Temperature between woolen undershirt and skin	93.8
Temperature under the tongue (average of six days)	98.3

Third set. Outdoors twenty minutes. Average of eleven days.

Atmospheric temperature	39.3
Temperature between coat and vest	61.1
Temperature between vest and linen shirt	69.7
Temperature between linen shirt and woolen undershirt	78.1
Temperature between woolen undershirt and skin	92.6
Temperature under the tongue (average of six days)	98.0

Fourth set. Ten minutes after returning indoors. Average of eleven days.

Temperature of room	75.7
Temperature between coat and vest	77.9
Temperature between vest and linen shirt	80.8
Temperature between linen shirt and woolen undershirt	86.3
Temperature between woolen undershirt and skin	93.1
Temperature under tongue (average of six days)	98.0

Average of 2 p. m. meteorological observations for eleven days.

Temperature of air	39.3
Temperature of wet-bulb thermometer	36.0
Relative humidity	73.0
Absolute humidity (grains per cubic foot)	2.08
Velocity of wind (miles per hour)	8.3

From the limited character of these observations it is not expected that the values derived from them will have other than a very restricted application. The chief reason for publishing them in their present shape is that the field of inquiry suggested by them is an extensive one and should yield to more complete investigation many facts of great practical utility; and, furthermore, because with the exception of some similar observations quoted by Van Bebber as having been made by Rubner they are the only ones of the kind known to the writer.

The following values are given by Van Bebber (Hygienische Meteorologie, W. J. Van Bebber, 1895, p. 132):

	Atmospheric temperature.	
	50° F.	79° F.
Temperature between coat and vest	73.6	83.8
Temperature between vest and linen shirt	75.9	84.7
Temperature between linen shirt and woolen shirt	77.4	85.3
Temperature between woolen shirt and skin	90.9	89.9

The statement of the atmospheric temperature is the only information given relative to the meteorological conditions under which these values were obtained.

At the present time it would evidently be imprudent, with the scanty data available, to dogmatize as to the relative importance of either the different meteorological elements or the various parts and qualities of clothing, but the following points appear noticeable enough to mention: The temperature of the different layers of clothing was influenced decidedly by the prevailing temperature of the immediate surroundings, the former rising and falling with rises and falls in the latter, but the degree of change was variable, and perhaps, if not certainly, was very much affected by the velocity of the wind. There was one point wherein a result of the writer's experiments differed from a corresponding one as given by Van Bebber, i. e., that the lower the atmospheric temperature the lower also was the temperature between the woolen shirt and the skin, this was contrary to Rubner's experience, and is worth calling attention to, inasmuch as Rubner appears to have attached much significance to the increased temperature between the skin and undershirt at the lower atmospheric temperature.

Another point noticed was in connection with the temperature of the body as shown by that taken in the mouth. Upon going outdoors the body temperature always fell, and the fall was greater in proportion to the time of exposure. Furthermore, upon returning indoors it did not rise quickly, but ten minutes afterwards remained as low as the last observation outdoors. Although no systematic observations were made with reference to ascertaining the time required for the body to regain its original degree, yet in the few casual experiments that were made it took from twenty to thirty minutes.

Coincident with the thermometric observations an attempt was made to estimate the subjective sensations while outdoors with reference to cold and warmth, and to express them in a few words ordinarily used. The degree of success or failure is shown in the column headed "subjective sensation" in the table appended.

THE STANDARD SYSTEM OF COORDINATE AXES FOR MAGNETIC AND METEOROLOGICAL OBSERVATIONS AND COMPUTATIONS.

By Prof. FRANK H. BIGELOW, dated June 22, 1897.

Uniformity of method in observation and also in computation constitutes one of the canons of modern science. As matters now stand, the comparative study of the published results of the observations in terrestrial magnetism and meteorology discloses an annoying variation in units and coordinate systems; a similar conflict prevails throughout the papers devoted to an analytic discussion of the observations. Since final general deductions can be best secured for science by cooperation, based upon uniform standards of coordinates, notation, and fundamental constants, it is the first duty of investigators to come to a sound agreement regarding these standard systems. In order to exhibit the present status, especially in the writings of the authorities who have chiefly influenced the development of these subjects, the coordinate axes and directions employed by them have been collected in tables for inspection. The papers cited are as follows:

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14. *Ferrel.*—Recent Advances in Meteorology. S.O. 1885.
15. *Oberbeck* and *Margules.* Abbe's Translations. 1891.
16. *Sprung.*—Meteorologie. 1885.

17. *Thomson* and *Tait*, *Helmholtz*, *Heaviside*, *Hertz*, *Poincaré*, *Boltzmann*, *Watson* and *Burbury*, *Basset*, in their respective treatises.

In order to bring the notations actually used by these authors into a single scheme for comparison, the following notation is now adopted: R, radius of earth; r, any distance from the center of the earth; θ, north polar distance; φ, north latitude; λ, east longitude. The first column of the

TABLE 1.—*The coordinate systems used in terrestrial magnetism.*

Author.	Potential.	Coordinate forces.	Direction.	Original notation.	
Gauss (1839), pp. 200, 202, 204	$V=-\Sigma\frac{m}{r}$.	$X=+\frac{dV}{dx}=-\frac{dV}{rd\theta}$.	North.	$u=\theta$	$X=-\frac{dV}{R\,du}$.
		$Y=+\frac{dV}{dy}=-\frac{dV}{r\sin\theta\,.\,d\lambda}$.	West.	$R=r$	$Y=-\frac{dV}{R\sin u\,d\lambda}$.
		$Z=+\frac{dV}{dz}=-\frac{dV}{dr}$.	Nadir.		$Z=-\frac{dV}{dr}$.
Erman and Petersen (1874), pp. 26, 30	$V=-\Sigma\frac{m}{r}$.	$X=+\frac{dV}{dx}=-\frac{dV}{rd\theta}$.	North.	$u=\theta$	$X=-\frac{dV}{r\,du}$.
		$Y=+\frac{dV}{dy}=-\frac{dV}{r\sin\theta\,.\,d\lambda}$.	West.		$Y=-\frac{dV}{r\sin u\,d\lambda}$.
		$Z=+\frac{dV}{dz}=-\frac{dV}{dr}$.	Nadir.		$Z=-\frac{dV}{dr}$.
Maxwell (1881), II, p. 121	$V=+\Sigma\frac{m}{r}$.	$X=-\frac{dV}{dx}=+\frac{dV}{rd\theta}$.	North.	$l=\varphi$	$X=-\frac{dV}{adl}$.
		$Y=-\frac{dV}{dy}=+\frac{dV}{r\sin\theta\,.\,d\lambda}$.	West.	$a=R$	$Y=-\frac{dV}{a\cos l\,.\,d\lambda}$.
		$Z=-\frac{dV}{dz}=-\frac{dV}{dr}$.	Zenith.		$Z=-\frac{dV}{dr}$.
Mascart and Joubert (1883), p. 413	$V=+\Sigma\frac{m}{r}$.	$X=-\frac{dV}{dx}=+\frac{dV}{rd\theta}$.	North.	$u=\theta$	$X=+\frac{dV}{r\,du}$.
		$Y=-\frac{dV}{dy}=+\frac{dV}{r\sin\theta\,.\,d\lambda}$.	West.	$l=\lambda$	$Y=+\frac{dV}{r\sin u\,dl}$.
		$Z=-\frac{dV}{dz}=-\frac{dV}{dr}$.	Zenith.		$Z=-\frac{dV}{dr}$.
Schuster (1889), p. 475	$V=+\Sigma\frac{m}{r}$.	$X=-\frac{dV}{dx}=+\frac{dV}{rd\theta}$.	North.	$u=\theta$	$X=+\frac{dV}{adu}$.
		$Y=-\frac{dV}{dy}=+\frac{dV}{r\sin\theta\,.\,d\lambda}$.	West.	$a=R$	$Y=+\frac{dV}{a\sin u\,d\lambda}$.
		$Z=-\frac{dV}{dz}=-\frac{dV}{dr}$.	Zenith.		$Z=-\frac{dV}{dr}$.
Schmidt (1889), p. 7; (1895) p. 9	$V=+\Sigma\frac{m}{r}$.	$X=-\frac{dV}{dx}=+\frac{dV}{rd\theta}$.	North.	$u=\theta$	$X=+\frac{dV}{r_0\,du}$.
		$Y=-\frac{dV}{dy}=-\frac{dV}{r\sin\theta\,.\,d\lambda}$.	East.	$r_0=r$	$Y=-\frac{dV}{r_0\sin u\,d\lambda}$.
		$Z=-\frac{dV}{dz}=+\frac{dV}{dr}$.	Nadir.		$Z=+\frac{dV}{dr}$.
Von Bezold (1895), p. 3	$V=-\Sigma\frac{m}{r}$.	$X=+\frac{dV}{dx}=-\frac{dV}{rd\theta}$.	North.	$\beta=\phi$	$X=+\frac{dV}{r\,d\beta}$.
		$Y=+\frac{dV}{dy}=+\frac{dV}{r\sin\theta\,.\,d\lambda}$.	East.		$Y=+\frac{dV}{r\cos\beta\,.\,d\lambda}$.
		$Z=+\frac{dV}{dz}=-\frac{dV}{dr}$.	Nadir.		$Z=-\frac{dV}{dr}$.
Carlheim-Gyllensköld (1896), p. 4	$V=-\Sigma\frac{m}{r}$.	$X=+\frac{dV}{dx}=-\frac{dV}{rd\theta}$.	North.	$\mu=\cos\theta$	$X=+\sqrt{1-\mu^2}\,.\,\frac{dV}{r\,d\mu}$.
		$Y=+\frac{dV}{dy}=-\frac{dV}{r\sin\theta\,.\,d\lambda}$.	West.	$\omega=\lambda$	$Y=-\frac{dV}{r\sqrt{1-\mu^2}\,.\,d\omega}$
		$Z=+\frac{dV}{dz}=-\frac{dV}{dr}$.	Nadir.		$Z=-\frac{dV}{dr}$.

Green, Mathematical Papers (1828), p. 21, adopts the positive potential function $V=+\Sigma\frac{m}{r}$.

table contains the author and reference page, the second, the author's definition of the potential, the third, his coordinate forces when expressed in the standard notation adopted above, the fourth, the positive coordinate directions, and the fifth the original notation as employed in the respective papers, together with the equivalents in the standard system.

It is thus seen that in terrestrial magnetism Gauss, Erman and Petersen, Von Bezold, and Carlheim-Gyllensköld adopt the definition of the potential function $V = -\Sigma\frac{m}{r}$, where m is the elementary mass and r the distance; but that Maxwell, Mascart and Joubert, Schuster, and Schmidt adopt the form $V = +\Sigma\frac{m}{r}$. This radical divergence, therefore, separates all the writings on magnetism into two groups. It is also seen that Gauss, Erman and Petersen, and Carlheim-Gyllensköld adopt as the positive coordinate directions north, west, nadir; that Maxwell, Mascart and Joubert, and Schuster adopt north, west, zenith; and that Schmidt and Von Bezold adopt north, east, nadir. There are thus three groups of papers in this respect.

In meteorological literature Ferrel adopted the Laplacian coordinates, x on axis of rotation, y in the meridian of reference, and z at right angles to the plane $x\ y$ in east longitude. Oberbeck and Margules permute the axes, making z the axis of the earth's rotation. In polar coordinates, with origin at the center of the earth, all use Laplace's system, except Guldberg and Mohn, who count angular distance along the meridian from the equator, instead of from the pole. The system with north polar distance is clearly superior for general investigations. When transference is made of the origin from the center to the surface of the earth, the advantage of Laplace's polar system appears more strongly than ever. The confusion of coordinate axes between the author's is considerable. Ferrel consistently uses the system south, east, zenith, but his notation is irregular and he uses letters, u, v, w, set apart as velocities, for linear distances. Margules adopts the same system of rotation, and Sprung, also, in portions of his treatise on Meteorology. Guldberg and Mohn, Oberbeck (in part), and Sprung (in part) adopt, on the contrary, the opposite surface rotation, east, south, zenith; so, also, Hemholtz, p. 82.

In more distinctly physical treatises, Thompson and Tait, Heaviside, Watson and Burbury, Basset, Boltzmann, Poincaré, and others adopt the convention of right-handed rotation about an axis drawn outward normal to the surface; while Helmholtz and Hertz adopt a left-hand rotation about an outward drawn normal.

It will probably be admitted that modern physics has quite uniformly settled upon three fundamental conventions:

1. Definition of potential, $V = +\frac{m}{r}$.
2. Positive normal drawn outward from the surface.
3. Right-handed rotation, with translation along the positive direction.

It is held by the writer that terrestrial magnetism and meteorology must conform themselves eventually to these three conventions. Any other system will be powerless to resist the influence of the canons of physics, if it is not in harmony with them.

The accompanying Table 1 shows that Maxwell, Mascart and Joubert, and Schuster in terrestrial magnetism; Ferrel, Oberbeck (in part), Margules, and Sprung (in part) already conform to this standard. Gauss, Erman and Petersen, Carlheim-Gyllensköld should change the definition of potential from $V = -\Sigma\frac{m}{r}$ to $V = +\Sigma\frac{m}{r}$, and also the vertical direction from nadir to the zenith. Schmidt and Von Bezold have the right-handed rotation, but the positive normal is drawn inward, and this should be changed to outward; also Von Bezold should change the sign of the potential.

While there are some variations in the literature of meteorology, Ferrel's system, which was fortunately perfect in this respect, has happily helped to put most of the analytical papers on the motions of the atmosphere in an acceptable form. Developing the angle θ from the north pole, and the angle λ toward the east, with radius extended to the zenith, the system x south, y east, z zenith, with u, v, w for velocity, and $\frac{du}{dt}, \frac{dv}{dt}, \frac{dw}{dt}$ for acceleration, gives a notation which, if used by all writers, would reduce the labor of the comparative study of the laws of the dynamics of the atmosphere to a minimum.

In terrestrial magnetism, unfortunately, the positive magnetic pole of the earth is in the southern geographical hemisphere, and the positive force develops northward, so that x north, y west, z zenith, would be the corresponding system. Confusion was originally introduced by taking the dip in the northern magnetic hemisphere as positive; it is properly negative in pure physics. The simplest change is, therefore, to make the vertical force positive in the Southern Hemisphere, directed upward, and negative in the Northern Hemisphere, with the corresponding values for the dip.

The International Conference at Paris, September, 1896, voted to adopt the following coordinate system in terrestrial magnetism:

TABLE 2.—*The coordinate systems used in meteorological papers.*

Authorities quoted.	Origin at center.						Origin on surface.					
	Rectangular.			Polar.			Rectangular.			Polar.		
	Axis of rotation.	Meridian of reference.	Perpendicular to plane.	Radius.	North polar distance.	East longitude.	South.	East.	Zenith.	Distance from center.	Angle from center.	Around center.
Laplace, Mec. Celeste, I, VIII, § 29, § 35	x	y	z	r	θ	ϖ	......	......	......	......	......	......
Ferrel, Prof. Paper, S. S., VIII, p. 6	x	y	z	r	θ	ϕ	......	......	N	s	ρ	μ
Ferrel, Meteorol. Research., pp. 370-378	x	y	z	r	θ	ϕ	u	v	h	u	ρ	μ
Ferrel, Report, 1885, C. S. O., pp. 181, 292	x	y	z	r	θ	ϕ	U	V	X	......	......	......
Guldberg and Mohn, Mouv. de l'Atmos., II, p. 4	......	......	......	R	$(90-\Theta)$	......	$-x$	y	z	r	......	ϕ
Oberbeck (Abbe's Trans.), pp. 153, 178, 183	z	x	y	r	θ	ϕ	y	x	z	......	......	......
Margules (Abbe's Trans.), p. 300	z	x	y	r	ϖ	λ	x	y	z	......	......	......

X positive north,
Y positive east,
Z positive vertical,

the latter ordinate, whether positive to the zenith or to the nadir, apparently being undefined in the preliminary report. This decision seems to be of doubtful validity, (1) since in case the vertical direction is positive to the nadir the second convention is disregarded, and (2) if positive toward the zenith, then the third convention is not observed.

There are other reasons for adhering to a system of coordinates embracing the three conventions above recommended, as (1) the usual scheme of trigonometric instruction, (2) the agreement with the cyclonic circulation, when taken positive and right handed in the Northern Hemisphere, (3) the convenience of recording movements of clouds as vectors which are tangent to the stream lines, "as the arrow flies," instead of in the improper, even if popular, notation of the direction from which the wind blows.

Although the meteorological system develops naturally, and by general usage, from the north pole, but the magnetic system from the south pole of the earth, yet some authors may prefer to count from the south point in both systems; in this case the potential and the coordinate forces in terrestrial magnetism will be:

$$V = + \Sigma \frac{m}{r}$$

$$X = -\frac{dV}{dx} = -\frac{dV}{r d\theta}, \text{ positive south.}$$

$$Y = -\frac{dV}{dy} = -\frac{dV}{r \sin\theta \, d\lambda}, \text{ positive east.}$$

$$Z = -\frac{dV}{dz} = -\frac{dV}{dr}, \text{ positive upward.}$$

It is contended in this paper that all discussions and records of observations should conform to the three standard conventions. If terrestrial magnetism can not be brought into full harmony with the accepted meteorological system, then, at least, the only difference allowable should be that the magnetic rotation starts with zero at the north point and increases westward, while the meteorological zero is at the south point and the rotation is positive eastward; in both systems the positive rotation is in the direction north, west, south, east.

AURORA AUSTRALIS OF APRIL 20.

By M. W. CAMPBELL-HEPWORTH, F. R. A. S., Lieutenant Royal Naval Reserves.

The Chief of the Weather Bureau is indebted to Commander J. E. Craig, United States Navy, Hydrographer, in charge of United States Hydrographic Office, for the following copy of a description of an aurora australis observed on board the Canadian Australian Royal Mail Steamship Company's steamer *Aorangi*:

On April 20, in latitude 47° 30′ S., longitude 96° 15′ E., at 6:30 p. m., a diffused light, bearing resemblance to that which may be observed at night over a city strongly lighted by electricity, was observed over the southern arc of the horizon. Horizontal flashes soon spread and flared in every direction from this light above the horizon, increasing in length and brilliancy until at 7:30 p. m. they were shooting across the sky to within 30° of the northern arc of the horizon.

Cones and circles of light traveled rapidly over the whole sky, flashing beams of intense brilliancy from one to the other. This continued until 8:30 p. m. A remarkable change then took place; the sky being cloudless, moon and stars shining brightly, an arch of bright green light fading off into yellow formed over the southern horizon, rose rapidly to a higher and yet higher altitude and was followed by similar arches in regular sequence until there were six distinct arches, their apices being from 10° above the southern horizon to 60° above the northern horizon. These were formed of narrow vertical bands of light from 5° to 20° deep, bright green, and yellow at the upper edges and of a rosy hue at their bases. Subsequently, these arches rapidly changed their shapes in all parts of the sky, others forming, but some kind of luminous curve was always preserved, except in one or two cases, when perfect right angles were formed. At 9 o'clock a brilliant circle formed around the zenith, composed of narrow bundles of light, similar to those already described, but pendent overhead, and having a rotary motion; this circular motion having been apparent in all the formations hitherto mentioned. The circle was about 30° in diameter and the rays of colored light or narrow bands of colored light, as I have elsewhere termed them, were not quite vertical but slightly inclined, thus producing an effect which gave the impression of what one might suppose would occur in the vortex of an electrical cyclone. A cloudless sky showed through the center of this ring-shaped tassel of colored light. It then traveled to the westward. Later, a spiral cord of light formed, having its center at the zenith, exhibiting three distinct turns of a coil. Two intensely bright formations, resembling waterspouts brilliantly illuminated, flared in the west, and a remarkably bright meteor, starting from Canis Major, traveled slowly across the sky, discharging at intervals fragments of color, and thus adding to the splendor of the scene.

Prior to 8:30 p. m., all flashes of light had been horizontal. After that time, they were all vertical. A special feature in this display should be mentioned; these formations had all a westward movement.

After 9:15 p. m., the aurora was less brilliant, but burst into greater activity a few moments afterwards, more especially in the northern semicircle. This display lasted until 9:45 p. m. Atmospheric pressure for the past forty-eight hours had been abnormally low, the barometer remaining below 29.00 inches. At the time of the display it stood at 28.80 inches by "B. T." barometer 244, and was slowly rising. The temperature of the air was 43° F.; the wet bulb reading was 41° F. The wind was west-northwest (true), force from 5 to 4. It had been northwest throughout the day, force 7, and on the day previous, northwest, force from 6 to 8. Squally weather, accompanied by rain, hail, thunder, and lightning, has been experienced from the 18th until noon of the 20th.

On the night of April 22–23, in latitude 45° S., longitude 118° W. to 120° E., from 7 p. m. to 4 a. m., another auroral display was observed exhibiting the phenomena of the arches. At 9 p. m. (about), two arches, one after the other, rose slowly above the horizon, but on this occasion the sky became frequently clouded and the spectacle, although magnificent, had not that awe-inspiring grandeur which startled the eyes of the observer on the night of the 20th.

WIND-BAROMETER TABLE.

By E. B. GARRIOTT, Professor, Weather Bureau.

The following table presents, in form for ready reference, atmospheric signs which have been found to presage certain weather changes and conditions over the middle and upper Mississippi and lower Missouri valleys, the Great Lakes, the Ohio Valley, and the Middle Atlantic and New England States:

Barometer (reduced to sea level).	Wind direction.	Character of weather indicated.
30.00 to 30.20, and steady............	westerly ...	Fair, with slight changes in temperature, for one to two days.
30.00 to 30.20, and rising rapidly	westerly ...	Fair, followed within two days by warmer and rain.
30.00 to 30.20, and falling rapidly....	s. to e......	Warmer, and rain within 24 hours.
30.20, or above, and falling rapidly..	s. to e.......	Warmer, and rain within 36 hours.
30.20, or above, and falling rapidly..	w. to n......	Cold and clear, quickly followed by warmer and rain.
30.20, or above, and steady	variable....	No early change.
30.00, or below, and falling slowly...	s. to e.......	Rain within 18 hours that will continue a day or two.
30.00, or below, and falling rapidly..	se. to ne. .	Rain, with high wind, followed within two days by clearing, colder.
30.00, or below, and rising	s. to w......	Clearing and colder within 12 hours.
29.80, or below, and falling rapidly..	se. to ne....	Severe storm of wind and rain imminent. In winter, snow and cold wave within 24 hours.
29.80, or below, and falling rapidly..	e. to n......	Severe northeast gales and heavy rain or snow, followed, in winter, by cold wave.
29.80, or below, and rising rapidly...	Going to w.	Clearing and colder.

The character of the precipitation, whether rain or snow, is governed by the temperature.

Weather wisdom, gained by an observance of local atmospheric signs and conditions, has been possessed by man from time immemorial. Much of this wisdom has been embodied in proverbs which possess considerable merit for the sections and localities in which they originated. In farming communities sayings regarding the wind, the temperature, the clouds, and evidences of atmospheric moisture have been handed down from generation to generation; and in mari-

time circles, where experience over a wider territory is had, these observed conditions have been supplemented with barometric observations.

Local signs and observations, however, rarely indicate the duration and intensity of threatened atmospheric disturbances save in the immediate presence of a storm, and barometric readings are ofttimes misleading, unless considered in connection with the readings taken at points remote from the place of observation.

By the modern system of weather services reports of local observations are collected by telegraph, collated, and charted, and the forecaster has for his consideration not only the signs and conditions noted in the various localities, but also a general graphic presentation of atmospheric conditions over the entire region covered by the stations of observation.

Without at this time considering original causes the unequal air distribution over the surface of the earth may be recognized in the areas of high and low barometer which appear on the weather map. These areas of high and low barometer have a progressive movement, which in the middle latitudes is from west to east at an average rate of 20 to 40 miles an hour. The high areas are usually attended by settled, fair, and seasonably cool weather, and the low areas by unsettled, stormy, and warm weather. The weather maps show that the low areas are vast atmospheric whirls or eddies with the wind blowing spirally and contra-clock wise, inward toward the center of the whirl, where the lowest barometer is found. The areas of high pressure show winds blowing spirally outward from the center of highest barometer, the circling movement being in a direction contrary to that observed within the areas of low barometer. A consideration of the progressive and circling movements of the high and low areas will reveal the causes which produce local weather signs and conditions.

In weather calculations the barometer is the pulse, and the wind is the breath of storms, and the thermometer registers the variation of the vital function heat. A consideration of these elements, or symptoms, in their various phases constitutes a diagnosis by means of which weather changes of the near future may, as a rule, be approximately determined. Rapid oscillations or changes in the barometer indicate early and marked changes in the weather. When barometric changes of this character occur during fair weather, and are downward, and the wind and temperature respond and coöperate in accordance with recognized rules and laws, foul weather may be expected; when the barometer has a decided upward inclination, and is supported by certain winds and thermal conditions, fair weather, or a return to fair weather, is indicated.

The contents of the table herewith are a key for the determination of weather changes indicated by the barometer and the direction and shifts of the wind. In sections of the United States named at the head of the table the advance of an area of low barometer, or a general storm area, is indicated by the wind going to points between south and east, and when the storm center is approaching from the southwest the winds will change to east or northeast. This shift of wind, if accompanied by falling barometer, will be attended by increasing cloudiness, and the southerly winds will bring the warmth of lower latitudes; and, as warm air has a greater capacity for moisture than cool air, the amount of moisture in the atmosphere will increase. The amount and rapidity of the fall in the barometer will usually indicate the nearness and intensity of the approaching storm. When the center of the low barometer has passed over a given locality the barometer will begin to rise, the wind, still blowing and circulating toward the center of the atmospheric whirl, will shift to west and northwest, the temperature, brought from colder latitudes by the winds west of the center, will be lower, and the weather will clear under the influence of an area of high pressure, which always follows in the wake of an area of low atmospheric pressure.

NOTES BY THE EDITOR.

WEATHER TELEGRAPHY IN ENGLAND AND AMERICA.

It is well known that the first weather maps for the United States, as compiled daily by means of telegraphic reports, were made by the Smithsonian Institution. In 1843 Espy had been engaged by the United States Government as meteorologist; he was assigned to duty, at first under the Surgeon-General of the Army, afterwards, to the Secretary of the Navy and, finally, 1848, under the Secretary of the Smithsonian. During the first years of his work he compiled many daily maps from the monthly returns of the meteorological observers scattered over the country, and he published a liberal selection in his four successive meteorological reports. In 1847 Professor Henry began to devote special attention to this subject, and, during the subsequent years, in cooperation with Professor Espy, the Smithsonian system of observers was largely extended, special investigations were made, the telegraph offices were supplied with instruments and reports secured for the compilation of daily maps; the prediction of storms was definitely proposed as the ultimate object of the work in hand. The telegraphic reports seem to have begun in 1849, at least experimental maps were then made for July 19th and 20th for Professor Henry by Dr. A. Jones, in New York, and sent to Washington as samples. Dr. Jones wished to have New York made the central collecting point.

Simultaneously with the work of Espy and Henry and their colaborers, Redfield, Loomis, Coffin, and Guyot, a similar development was going on in England. The electric telegraph company (using Wheatstone's system) had been incorporated in England in 1846, and by 1851 it had erected about 2,000 miles of wire. At the first great World's Fair, at the Crystal Palace near London, in 1851, weather reports were received by telegraph from many points and a daily weather map published by lithography, beginning with August 8, 1851. A facsimile of this map is reproduced in Symons' Monthly Meteorological Magazine, September, 1896.

The last number of Symons' magazine (April, 1897) contains further interesting information with regard to similar work in 1849 and 1850. Just before receiving that number of this magazine, the present Editor had discovered and copied the following interesting letter from Mr. James Glaisher which has been, fortunately, preserved among the fragments of correspondence saved from the destruction of the records of the Smithsonian at the disastrous fire of January, 1865. These records are now accessible to the student, and the letter here reprinted, taken in connection with the important and authoritative sketch published by Mr. Symons, shows that Mr. James Glaisher, the nestor of meteorologists, who is still living at an advanced age in London, was, so far as we know, the first to organize a system of strictly simultaneous observations and to compile the corresponding daily bulletins and weather maps. According to Mr. Symons, Glaisher's first map was that for June 14, 1849, or five weeks before that of Dr. Jones in New York. He does not appear to have utilized the expensive assistance of the electric telegraph, but by the cooperation of the railroad companies, and at the expense of the proprietors of the Daily News he was

able to gather together every night the meteorological observations made at 9 a. m. (Greenwich time) and publish his *bulletin* in the next morning's paper. The *map* was not published but was compiled and studied by himself individually. The similar work done in this country, the history of which has often been rehearsed, was evidently as little known to Glaisher as was his own work in America. It is but another and a most striking illustration of the simultaneous origin of many of the important discoveries and inventions that mark the progress of the human race throughout the world.

Regretting that we are not able to print the letter written by Professor Henry on June 5, we think ourselves fortunate in submitting the following reply by Mr. Glaisher:

13 DARTMOUTH TERRACE, BLACKHEATH, KENT,
July 8, 1850.

MY DEAR SIR: In reply to your letter of June 5 I beg to say that I shall have great pleasure in sending you copies of the forms I use in collecting meteorological observations, and the results of my experience are entirely at your service. In your letter you have not indicated the channel through which you wish the papers to be sent, and, therefore, I shall forward them through the Royal Society.

With the papers I shall send you will find a few copies of an address of a new Society, which myself with a few gentlemen have formed. It is under the presidency of J. C. Whitbread, esq.

At the meeting of the council of this Society, held a few days since, I did myself the pleasure of reading the letter with which you have favored me, and it was resolved that a form for collecting observations, drawn up by myself, and now in the printer's hands, should be sent to you, and the council expressed a wish to cooperate with the Smithsonian Institution as far as possible. Hitherto, there has been no fund devoted to meteorology in England, and I have borne all the expenses, excepting that each gentleman has furnished himself with his instruments; government, however, has published the results in the reports of the Registrar General, some of which I send.

We hope now to collect much more information than I have hitherto done, and if the system adopted by you be similar to that adopted by us, their united results will be more valuable.

Among the forms sent you will find one very simple, and which is used daily at about 50 different railway stations at the hour of 9 a. m., Greenwich time. The different railway companies have agreed that the station masters shall take these observations, and that they shall be brought to London the same day, free of expense. The proprietors of a London newspaper, The Daily News, incur the expense of sending a messenger to the several railway termini at about 2 a. m., and all the returns thus collected are immediately printed, so that the weather of the day previous, at one time, all over the country and parts of Scotland are publicly known. On receiving the paper I lay all these returns on a map, using a long, narrow-headed arrow to indicate the direction of the wind, and other symbols for the other information, and thus daily I know the weather, direction of the wind, etc., the whole being exhibited to the eye. Several gentlemen, whose names you will see in a form headed "simultaneous observations taken at 9 a. m.," have agreed to cooperate with me, and to take all the observations taken by the railway station masters, as well as others, with their full sets of instruments. It is believed by these arrangements, that very important information, with respect to the passage of storms in particular, will thus be collected. I have already more than one year's observations and daily maps in an unbroken series.

Previous to commencing these observations I visited every station, determined its meridian, fixed a compass card, and instructed the station master, remaining with him till I felt certain he would take the observations well.

The method I have adopted with respect to the observations of general phenomena is first to superintend the making of the instruments, then their selection. I determine their index errors by carefully examining and comparing every instrument with a standard. I visit the different locations in which they are placed, and examine the positions of the instruments themselves.

On receiving the returns I first examine every one by itself; second, I divide them into groups, including the observations from one known good observer, and then I compare every result in every return with the corresponding result in the standard return, taking into account difference of elevation, etc.; next I form groups according to latitude, and another according to the longitude, by these means I usually detect any errors, and I believe very few escape. After this I proceed to their combinations, etc.

In future the British Meteorological Society intends having monthly returns, including every observation, and for which a form is now being set up, I shall, therefore, be more certain of the accuracy of the results.

I should be glad to have some arrangements made with the captains of steam vessels between America and England, thus connecting the observations taken in both countries, and I think this may ultimately be done.

I have the honor to be, Sir, with much respect and esteem,
Yours, very truly,

JAMES GLAISHER.

CAPTAIN DANSEY'S KITE FOR STRANDED VESSELS.

In the Transactions of the Society of Arts, Manufactures, and Commerce for 1825 a proposition was published which at the time received wide circulation, and which we recopy from the American Journal of Science and Arts for February, 1826, Vol. X, p. 184:

Captain Dansey, of the British Royal Artillery, proposes the employment of a kite to facilitate "communication with vessels stranded on a lee shore, or under other circumstances where badness of weather renders the ordinary means impracticable. A sail of light canvas or holland (being cut to the shape and adapted for the application of the principles of the flying kite) is launched from the vessel or other point to windward of the space over which a communication is required, and as soon as it appears to be at a sufficient distance a very simple and efficacious mechanical apparatus is used to destroy its poise, causing it to fall immediately, but remaining still attached by the line and moored by a small anchor, with which it is equipped." One end of the rope being thus conveyed to the shore and fixed by this small anchor, some one of the hands is enabled to get on shore and render assistance to others. The importance of the object is sufficient to recommend every expedient for its accomplishment. Captain Dansey is particular to recommend certain proportions for the construction of the kite. The canvas or holland is extended upon two spars whose lengths are to each other as two to three, the crosspiece intersecting the standard so that the upper section of the standard shall be to the lower section as one to two. At two points on the standard, about one-seventh of its length from the head and the same from the bottom, two lines are attached, the upper about one-sixth of the length of the kite and the lower two-thirds of its length, which combined form the bellyband, and to their point of junction is attached the line which is to retain the kite. The tail may be five or six times the length of the kite and its weight must be proportionate to the wind.

To effect the descent of the kite, the end of the line retained in the vessel is slipped through an apparatus, called the *messenger*, which, having a sail attached to it, is immediately taken up by the wind along the line toward the kite. This messenger, by driving out a wedge, which is essential for the proper poise of the kite, so transfers the center of suspension that a rapid descent of the kite and apparatus attached is a necessary consequence. Some experiments made with this instrument have given Captain Dansey much confidence in the success of his invention.

KERKAM'S KITES WITH ROCKET SIGNALS.

The military authorities of the world have developed several methods of utilizing the kite, as, for example, to raise on high an observer who wishes to overlook the neighboring country, or to elevate a string of signal flags, by means of which to communicate with distant friends. In the Louisiana Climates and Crops for July, 1896, Mr. R. E. Kerkam, the section director at New Orleans, says:

Three of the kites described in the MONTHLY WEATHER REVIEW for November, 1895, have been constructed here, two 44 inches high and one 88 inches high, the object of the latter being to find the lifting power and whether a system of rocket signals could not be fired therefrom at an elevation of about half a mile, using a time fuse for the firings. The Louisiana coast has no telegraph or telephone lines east or west of Port Eads, and the inhabitants are mostly ignorant fishermen, who will not take steps to repeat signals from one point to another. By a system of rocket signals, fired from the nearest towns to the coast, the rockets could be seen a long distance.

THE USE OF THE SEARCH LIGHT IN METEOROLOGY.

It was in December, 1872, that the Editor recommended to General Myer an easy method of determining the heights of clouds, and especially of the ill-defined stratus cloud. It was proposed to establish a search light whose beams should be vertical; the apparent altitude of the center of the luminous spot of the cloud was to be observed from a station not far away and the height was a matter of easy calculation. Since that time, and with the great increase in the power of the modern search light, further applications have become practicable; thus in harbors on the seacoast, where one wishes to ascertain the presence and development of low-lying fogs, the

search light which renders them visible is an invaluable assistant. A year ago some accounts were published relative to the cloud effects on Mount Low and Pasadena. According to these accounts Mount Low is about 15 miles north-northeast from Los Angeles and about 6 miles in a straight line from Pasadena. When the beam of light fell upon the bodies of clouds they at once became luminous, so that all the details of motion were visible; when the beam fell upon the falling rain the great cone of light glowed like molten metal. Distant clouds moving up the canyons were searched out and made to glow as if in the midday sunshine. It seems as if the formation and motion of fog and cloud at nighttime could be advantageously studied by means of the search light. The height at which fog first forms, and its gradual extension upward and downward during the night, would be a very interesting and profitable investigation.

WATERSPOUTS OFF LONG ISLAND.

On April 9 when the schooner *George M. Grant* was within a few knots of Montauk Point, the sea, which had been heavy all along the Long Island coast from Fire Island, rapidly became the roughest that Captain Pelton had ever seen. It was about eight bells, or 4 p. m., and thick weather had prevailed all day. During a temporary lift in the clouds Captain Pelton and his crew saw ahead four immense waterspouts. Three of them were at a comfortable distance, but the fourth passed by to starboard not an eighth of a mile from the schooner. Captain Pelton says that the noise made by the spout as it whirled by the vessel was like that made by an immense cornsheller.

WATERSPOUT, CLOUDBURST, OR TORNADO.

These three terms are often used indiscriminately when it would be easy to make a clear distinction between them. The Cleveland World of April 1 reports that "a waterspout on March 31 at Pana, Ill., threw a train of five cars and engine from the track of the Illinois Central." It does not appear likely that the damage here mentioned was done by wind; we may, therefore, infer that we have not to do with a tornado. A waterspout at sea is, according to all established usages in the English language, a different phenomenon from a heavy rain. Rain often accompanies a waterspout, but is not the prominent and characteristic feature. In the present case there could have been no waterspout properly speaking because the phenomenon occurred over the dry land of the interior of the continent. The daily weather map shows that the conditions were favorable for the formation of severe rains, thunderstorms, cloudbursts, and possibly tornadoes over Illinois on the afternoon of March 31; in fact a tornado was reported in Arkansas, but not waterspouts properly so-called. The use of the word "waterspout," when the writer really means only a heavy rain and wind, is not to be recommended. Such rains and winds are characteristic of thunderstorms and so-called "cloudbursts." In the present case it is likely that rain did not alone do the damage that is reported; a flooded track and a strong current of water would be needed to throw an engine from the track, or possibly the flood caused by the rain had undermined the track and thus indirectly caused the derailment. In general, in such cases as this it would be more proper to omit the words "waterspout" and "cloudburst." If the train was thrown from the track, or lifted from the track, as the headlines of the above article had it, this must have been due to a severe storm, but certainly not to a "waterspout" properly so called.

THE CHARACTER OF THE SKYLIGHT.

It is generally recognized that the influence of the sunlight and diffused skylight on the assimilation and growth of plants is brought about, first, by the heat that warms the earth and promotes the rise of the sap and, second, by the chemical action that is brought about by certain portions of the solar spectrum or more properly by radiations of specific wave lengths which fall upon the leaves of the plants and determine the formation of chlorophyll. When plants are cultivated under the influence of artificial lights, or in portions of the earth where the sunlight is obscured by cloud and fog, their development is usually slower, and they oftentimes fail altogether to produce a satisfactory sap or crop, or mature seed. This failure is reasonably attributed to the nature of the light and especially to the relative abundance of the radiations that produce favorable chemical changes as compared with those that produce undesirable changes. Any investigation into the influence of climate on plants and crops and any effort to cultivate plants by artificial light must take into account the relative energies transmitted in different portions of the spectrum. This distribution of energy with wave length is extremely irregular when the flame is produced by burning simple substances, as is shown by the fact that the spectrum is generally a series of alternating bright and dark or warm and cold spaces, but is much more regular when the radiation emanates from incandescent masses of solids before they evaporate into the gaseous condition. The distribution of energy throughout the spectrum is also greatly affected by the reflection from any surface; especially is this true in the case of the blue light of the sky, which is apparently a species of selective reflection from the minutest particles of aqueous vapor and which, notwithstanding its visual feebleness, is yet a matter of the greatest importance to agriculture. The total amount of energy received by any plant from the whole vault of the blue sky will in hazy weather equal that received directly from the sun and in the case of a thin layer of cloud or fog when the sun is invisible and the direct radiation therefore zero, the indirect diffused radiation may still be a large quantity. This latter consideration suffices to explain why many plants flourish in a foggy and cloudy climate and in shady places where the direct sunlight never penetrates.

The total energy involved in the molecular vibrations that constitute radiation is not shown by its effect in producing light or heat or chemical actions; these are but some of the modes in which a portion of that energy becomes appreciable to us. This radiant energy is conveyed from point to point by the mediation of the ether, and the ether can only become appreciated by its action on the so-called ponderable matter. It is probable that the energy involved in the movements of the ether is far greater than that which is made measurable by its visual, chemical, or thermal results, for there are still other results accomplished by it, as shown by the phenomena of electricity, magnetism, and gravitation.

The following table is quoted from a paper in the *Annalen der Physik und Chemie*, Vol. LIII, by Koettgen, who has measured the relative intensity of the light in the different parts of the spectrum from a large variety of lamps and burning substances. Her measures of the sunlight and skylight particularly interest the meteorologist and agriculturist. They were made in the first half of August, 1893, near Berlin, Germany, in latitude N. 52°. At this season and place the maximum midday altitude of the sun varies from 56° on August 1 to 52° on August 15. The measurements were made by directing the vision toward the blue skylight at a considerable altitude above the horizon, and probably in the northern portion of the sky, although that is not specifically stated. The results are given in the first column. When directed toward an overcast sky covered by an apparently uniform thickness of cloud, the measurements given in the fourth column were obtained, and when directed toward the shining white side of a cumulus cloud, those in the fifth column. When directed toward the sun itself, the measurements given in the sixth and seventh columns were obtained. The figures given in

these columns express the relative ability of different sources of light to produce light of a specific wave length; thus, for instance, if a Heffner lamp, which was used by Miss Koettgen as the standard, should at the yellow wave length 590, give the same intensity as the blue sky, then at the wave length 430, the blue sky would give a violet light that is 61.63 times as intense as the violet light of the Heffner lamp at that point of the spectrum. The author used the spectrum photometer invented by Dr. Arthur Koenig, and the table expresses visual results, and may not apply strictly to chemical or thermal results.

Wave length.	Spectrum color.	Blue sky-light.	Overcast sky.	Bright cloud.	Direct sunlight.	
Microms.						
690	Red.	0.21	0.25	0.37	0.31	0.30
670	Orange.	0.30	0.33	0.46	0.36	0.39
650	Orange.	0.40	0.43	0.56	0.45	0.48
630	Yellow.	0.53	0.57	0.69	0.60	0.62
610	Yellow.	0.74	0.76	0.82	0.79	0.80
590	Yellow.	1.00	1.00	1.00	1.00	1.00
570	Yellow.	1.58	1.57	1.56	1.34	1.34
550	Olive.	2.32	2.24	2.14	1.87	1.86
530	Green.	3.49	3.22	2.95	2.54	2.58
510	Green.	5.75	4.82	4.30	3.68	3.63
490	Blue.	9.41	7.39	6.65	5.56	5.48
470	Blue.	18.17	13.34	11.87	8.65	8.79
450	Blue.	33.95	24.53	19.85	....	13.60
430	Violet.	61.63	36.52	30.73	19.18	19.74

ATMOSPHERIC VAPOR.

The relation between the air and the moisture that it contains is very frequently stated incorrectly in elementary text books on physics and in ordinary popular explanations of meteorological phenomena. The error consists essentially in the idea attached to absorption, as in the sentence "a cubic foot of free air at a temperature of 50° will absorb 4.28 grains of aqueous vapor." This reads as though the writer considered the air in the same light as a sponge. Now, a sponge absorbs water by virtue of its own structure, and if the sponge were not in place the water would not leave its former position in order to ascend into the sponge. It is not so with air. The vapor of water ascends into the air by virtue of certain inherent properties of its own to which the air offers a slight resistance; if the air were absent from a cubic foot of space the vapor would still fill that space. The above quotation should, therefore, read as follows: A cubic foot of space, if saturated at a temperature of 50°, will contain 4.28 grains of aqueous vapor.

It takes a little time for aqueous vapor to diffuse into and thoroughly saturate a given cubic foot of space. It takes a little more time if that space already has air in it, but when the space is finally saturated the amount of the vapor is, so far as can be measured, appreciably the same, no matter whether the air is present or not. We must, therefore, speak of the vapor and the air as coexisting side by side, and it is no more proper to speak of the air as having absorbed the vapor than to speak of the vapor as having absorbed the air.

Owing to the mutual resistance of the air and vapor the molecules of the one do not pass through and among those of the other as freely as they pass through empty space. This gives rise to what is called the coefficient of diffusion or the time required for a unit volume of either gas to completely interpenetrate a unit volume of the other. The time required for this mutual interpenetration is also, of course, the time required for the mutual separation after they have been mixed together. As this time is quite appreciable it follows that both the air and the vapor move along together either horizontally, as wind, or vertically, as in the ascending currents that make clouds. Of course, in such a mixture the temperature of the air and the vapor are precisely the same, and we can not warm or cool one without warming or cooling the other.

If by any process the temperature is lowered below the saturating temperature of 50° F. then the cubic foot of space can not contain so much as 4.28 grains of aqueous vapor and the difference, whatever it may be, must be condensed into particles of water, forming haze, fog, clouds, rain, etc. The cooling just referred to is often brought about by the mere act of expansion as the warm moist air rises in the atmosphere. This expansion implies that work has been done in the interior of the mixture of air and vapor. A mass of perfectly dry air or a mass of perfectly pure vapor would cool by expanding just as the mixture does, but at ordinary temperatures the cooling of the dry air will not convert it into liquid air, whereas the cooling of aqueous vapor can easily convert it into liquid water. We have seen it stated that when the air expands it is, in this rarefied condition, not able to absorb so much aqueous vapor as in its former unexpanded or denser condition. But this is a mistake. Rarefied air at ordinary temperatures in the laboratory will hold as much vapor as denser air at the same temperature. The reason why rarefied air on mountain tops does not ordinarily contain as much vapor as the denser air at the base of the mountain is that the mountain air is cooler; it is the temperature and not the pressure that regulates the quantity of moisture in the upper strata of the atmosphere.

THE METEOROLOGICAL USE OF THE TERM "LOCAL."

The adjective "local" in the expressions "local rain," "local storm," "local wind," "local frost," etc., seems to require some special definition, so that the word may be used in a fairly uniform sense by all meteorologists. As preliminary to any attempt at a definition it will be best to collect together a few examples illustrating the wide range of ordinary usage.

The storm of September 6, 1895, in Oklahoma County, Okla., is stated in the Bulletin of the State Weather Service for that month to have been "the heaviest rainfall and thunderstorm of the season; it was purely *local in nature* and extended only over an area of 300 square miles."

A very heavy rain in southeastern Indiana is said to have given rise to "local floods" and destruction of crops over a region about 7 miles in diameter.

A series of "local rains" on the southern coast of Florida covered a region parallel to the coast for 50 miles north and south, and from 1 to 5 miles broad east and west.

A tornado is a "local phenomenon" whose destructive winds are felt at irregular intervals over a region that may, in an extreme case, be a 100 miles long and 1 mile wide, but is more apt to be from 5 to 20 miles long and scarcely $\frac{1}{8}$ of a mile wide.

A "local cloudburst" may occur in a mountain valley and over an area of scarcely $\frac{1}{4}$ of a square mile.

Is it possible to attach any definite idea to the term local? Judging from the preceding usages a West India hurricane begins as a "local whirl" in mid-Atlantic, grows into an extensive disturbance over the West Indies and our Atlantic coast, becomes a general storm in the North Atlantic, and disappears by merging into the "general circulation of the Northern Hemisphere."

The terms local and general are necessarily indefinite, and are needed for use with that understanding. But in order to give precision to our observations, it is hoped that observers will, when practicable, specify approximately the area in square miles over which any phenomenon is visible rather than content themselves with an indefinite word or usage.

WATER MEASUREMENTS FOR IRRIGATION.

The meteorologist measures the rainfall by the vertical depth of the equivalent layer of water that falls into the mouth of his gauge. Assuming that the catch of his gauge

is a fair sample of the rainfall over a large region in his neighborhood—which is often far from being true—he may compute the total quantity of water that falls upon any field or any drainage basin or river watershed. From this he gets a crude idea of the rainfall needed in order to perfect his crops, but it is a very crude idea because the crop only uses an exceedingly small percentage of this rainfall, the rest being partly absorbed in the ground and stored away for future dry seasons, partly returned to the air by evaporation, and mostly flowing off to the river by surface drainage. The total quantity needed for the ripening of a crop, when the water is carefully conserved, is a matter that is being determined by the experience of those who are farming by irrigation, and this style of farming which is common enough in our dry regions promises to become of fundamental importance for the whole country. There is no section of the United States that is not liable to droughts severe enough to affect the crops. A farm that covers a large area may in a dry season produce enough on the lowlands to counterbalance the loss of the crop on the uplands, but a small farmer can not afford to thus risk the loss of his whole crop, and must, therefore, be ready to raise his crops by artificial irrigation. But to irrigate requires either a windmill to pump up water from wells and reservoirs, or else a pond, ditch, or reservoir on some higher ground. In any case one must know what amount of water he needs, how large a reservoir must be built, and how powerful a windmill is required to do the work of pumping. To this end the ordinary meteorological method of measuring rainfall must be supplemented by a table of cubic measures.

An acre of ground covers 43,560 square feet, therefore 12 inches of rainfall means 43,560 cubic feet of water per acre. This may be converted into gallons or into pounds weight, if we choose, by the following considerations; one gallon contains 277.274 cubic inches, there are, therefore, 6.2321 gallons in a cubic foot; a gallon of pure water at 62° F., as weighed in the atmosphere, weighs 10 pounds. It will, however, be simpler for our present purposes to measure the water in cubic feet. The quantity of water per acre for a given depth of rainfall is expressed in cubic feet in the following table:

Rainfall (depth).	Equivalent per acre.
Inches.	*Cubic feet.*
0.10	363
0.50	1,815
1.00	3,630
2.00	7,260
3.00	10,890
4.00	14,520
5.00	18,150
6.00	21,780
7.00	25,410
8.00	29,040
9.00	32,670
10.00	36,300
11.00	39,930
12.00	43,560

In gauging the amount of water in streams the unit of measurement is a rate of flow equivalent to 1 cubic foot of water per second of time, and the carrying capacity of a ditch must be expressed in these units.

Another standard of measurement is the so-called miner's inch, but this is quite an indefinite term, inasmuch as the flow of water corresponding to a miner's inch varies with the structure of the gate or sluiceway and the construction of the aperture through which the water flows, so that actual experiment has shown that the miner's inch, as used in Colorado, is equivalent to 11.7 gallons of water per minute, while that used in California is 9 gallons per minute.

MELTING SNOW AND RIVER FLOODS.

The floods in the Mississippi and Missouri are often attributed to the influence of melting snow in the Rocky Mountain Region, but this is really only a small item in comparison with the rainfall in the lower Missouri, the upper Mississippi, the Arkansas, and the Ohio watersheds. The recent great flood in the Mississippi was demonstrably caused by a combination of floods due to such rainfall. In connection with the experimental study of the development of agriculture by irrigation, the question of water supply, whether it comes from artesian wells or rain, from rivers or from melted snow, has been especially studied at the Agricultural Experiment Station of the State Agricultural College at Fort Collins, on the Cache a la Poudre River. In the course of this investigation measurements of the discharge, expressed in cubic feet per second, were made at stations on the Poudre and the Platte Rivers, after shutting off all the head gates leading into the irrigation ditches. Full accounts of the studies that have been made in connection with irrigation have been published in the bulletins of the Experiment Station, Nos. 9, 13, 16, 22, 26, 27, 33. From the last bulletin, dated January, 1896, it appears that the first gauging of the Poudre River was made in October, 1885, and the discharges in successive years at the gauging station, in cubic feet per second, were as follows:

	Cubic feet per second.	Rainfall since Jan. 1.	Rainfall within 3 weeks.
		Inches.	*Inch.*
1. 1885, October 12-15	127.609	....	....
2. 1889, October 14-17	68.723	11.22	0.34
3. 1890, October 16-18	80.776	13.12	0.70
4. 1891, October 23-30	97.58	14.62	0.19
4*a*. 1891, November 3	107.01	4.62	0.19
5. 1892, March 10-12	65.02	2.72	0.83
6. 1892, October 5-8	62.92	13.94	0.00
7. 1893, November 9-11	52.47	6.28	0.00
8. 1894, March 13-15	99.21	0.85	0.00
9. 1894, August 20-23	268.07	9.25	0.08
10. 1895, October 9-14	66.47	16.60	0.00

The measurements made below the gauging station show that the water which passes any point is not only that flowing in the channel just above, but is increased by an additional amount due to seepage, which is very large in the sandy soil of the Poudre and Platte valleys. In the spring time this seepage largely represents the water that has settled into the surrounding soil from melted snow, while in the summer time it results from drainage and rainfall. The discharge of the river proper at the Fort Collins gauging station, which is in the canyon about 12 miles above the college and above the head gates of all the principal canals, might be expected, therefore, to increase with the melting of snow on the higher lands to the westward, but the actual gaugings seem to indicate that the snow water, which permeates the soil very slowly, is not so important as the rainfall of the spring and summer months. The seepage is greatly favored by the warmth of the soil, since heat decreases the viscosity of water. This effect has been studied by Professor Carpenter and found to be appreciable. The average discharge at the gauging station, as deduced from records of a number of years, varying between three and twelve for the different months, is as follows:

	Cubic feet per second.		Cubic feet per second.
January	110	July	1,018
February	83	August	362
March	70	September	173
April	237	October	136
May	1,245	November	81
June	2,017	December	74

In continuation of these normal values the following items of daily discharge are quoted from the weekly Poudre River bulletins that are now issued by Prof. L. G. Carpenter of the experiment station. His bulletins, Nos. 1 and 4, for

the week April 14–20 and May 5–11, are the only ones at hand, but will illustrate the slight importance of melted snow as compared with rain.

Up to April 14 the river remained low; the discharge was a little over 100 cubic feet per second. The warm, clear days of Friday, Saturday, and Sunday caused a more rapid melting of snow and an increased volume in the river on Sunday, Monday, and Tuesday. The average for Monday, April 20, was unusually large for this season. The reports indicate that there is little snow left on the mountains below an elevation of 8,000 feet. The amount of snow has been greater than usual, and the total amount of water received (namely at the gauging station) will be greater than for a number of years. Nevertheless there will be the usual scarcity late in the season.

From the bulletin for May 5–11, we quote:

The week having proved a warm one with the temperature of 70° and above, each day at the Agricultural College, and 55°, or over, at elevations of 9,000 feet, the melting of the low-lying snow has proceeded rapidly and the river has exceeded the flow for the corresponding week even in the exceptional year of 1885. The self-recording instruments show that the high water due to the melting of snow at midday on the mountains now reaches the gauging station in the canyon about 5 a. m. of the subsequent day.

The following averages are copied from these bulletins:

Discharge in cubic feet per second of the Poudre River.

Date.	1897.		Average for 1896.	Average, 10 years.
	Daily average.	Daily maximum.		
Wednesday, April 14	128	138	93	145
Thursday, April 15	158	184	124	155
Friday, April 16	173	180	140	160
Saturday, April 17	214	233	145	169
Sunday, April 18	247	364	120	208
Monday, April 19	470	571	109	220
Tuesday, April 20	450	480	114	239
Average for week	270	....	120	185
Wednesday, May 5	1,163	1,240	522	612
Thursday, May 6	1,251	1,321	708	686
Friday, May 7	1,427	1,502	946	748
Saturday, May 8	1,486	1,579	1,125	821
Sunday, May 9	1,472	1,602	....	916
Monday, May 10	1,439	1,546	....	1,000
Tuesday, May 11	1,458	1,568	....	990
Average for week	1,385	....	....	816

Averages for the corresponding weeks in previous years.

Year.	April 14-20.	May 5-11.	Year.	April 14-20.	May 5-11.
1884	146	911	1891	109	143
1885	294	1,358	1892	....	....
1886	....	773	1893	....	....
1887	294	....	1894	....	977
1888	136	354	1895	344	962
1889	93	283	1896	121	*825
1890	157	722	1897	[illegible]	1,385

* From the average for 14 days.

SNOWFALL IN COLORADO.

In connection with the preceding subject the most accurate estimates of the amount of snowfall become important. Mr. F. H. Brandenburg of the Weather Bureau, section director for Colorado, on March 10, issued a special snowfall report for that State. In addition to the data furnished by ninety voluntary observers he has received special snowfall returns from about two hundred and fifty special correspondents. According to these over the upper drainage basin of the Arkansas, in general, the snowfall has been greater than last year, and in many cases greater than for many years and large quantities of snow water will be held in reserve. Over the South Platte drainage area much more snow than usual, and the heavy snow slides in the timber will cause it to remain longer than usual. On the Continental Divide, over Clear Creek and Gilpin counties, the fall has been less than the average. Over the upper Rio Grande Basin snowfall was comparatively light, but lower down there was a marked excess. Over the Gunnison River watershed snowfall has been deficient. On the average for the whole eastern slope of Colorado the available water supply will be above the normal.

EVAPORATION AT FORT COLLINS, COLO.

In the Annual Reports of the experiment station at Fort Collins for 1889, 1890, and 1891 (which is the last at hand) details are given as to the measurements and experiments made in order to determine the amount of evaporation, in open air tanks, as well as in the running water of canals. The evaporation from tanks in the sunshine must depend upon the wind at the surface of the water, on the temperature of the water surface, and on the dryness of the air that blows over it; in place of exact measurements of these data approximate values had to be used. The report of Professor Carpenter states that the evaporation expressed in inches of depth of water in twenty-four hours may be computed by the following formula:

$$E = 0.39\ (P - p)\ (1 + 0.02\ W)$$

where P is the vapor tension corresponding to the temperature of the surface of the water; p is the vapor tension actually observed in the free air; w is the movement of the wind in miles, in twenty-four hours, at the surface of the water. In computing daily and monthly averages the mean temperature of the water surface is assumed to be the mean between the observations made at 7 a. m. and 7 p. m. The wind was measured by means of the anemometer on a tower a hundred feet distant. The moisture present in the air was deduced from dry and wet bulb thermometers. The coefficients 0.39 and 0.02 give a computed evaporation that is generally within 10 per cent, and on the average of the year is within 2 per cent of the measured evaporation. During 1890 the average daily evaporation from a 3-foot tank sunk in the ground was 0.15 inch. During 1891 the daily evaporation ranged between 0.18 in July and 0.02 in December.

HAIL AND A RAIN GAUGE FOR ITS MEASUREMENT.

The voluntary observer at Beaver in Oklahoma is quoted in the April report of the Oklahoma section as follows:

On the 27th heavy hailstorm came directly from the west, rain lasted twenty minutes, and fully an inch of hail fell; the ground appeared covered with snow. Hail drifted in places to 6 inches deep; 0.70 inch of rain was in the gauge, but no hail, and I estimated the melted hail at 0.30. Hail certainly all bounded out of the gauge as examination was made immediately after the rain ceased.

The difficulty of securing an accurate record of rainfall has led to several improvements in the construction of the rain gauge, the most important of which was the shielded gauge described by Prof. Joseph Henry as early as 1853, and the other form of shielded gauge devised by Professor Nipher in 1878. These shields are intended to protect the gauge from the loss of rainfall by the action of the wind at the mouth of the gauge. Very nearly the same protection against the wind results from the use of the protected gauge introduced by Boernstein and favorably reported upon by Wild and Herrmann.

Another source of error is due to the spattering of raindrops that are broken up into small rebounding particles by striking the ground. The spattering slightly increases the catch of the gauge, whereas the wind effect diminishes the catch to a very appreciable and sometimes a very large extent. A third source of trouble is that brought to mind by the above quotation from the Oklahoma report. Not only do the elastic hailstones bound out of the gauge, but large drops of water may easily do the same if the gauge is improperly constructed; if the drops do not bound outward as a whole, they may still break up and be partly lost as outward spatter. The remedy for this must consist in setting

the bottom of the gauge, or the sloping funnel of the receiver, so far below the mouth of the gauge that drops and spatter and hailstones can not easily bound out and be lost.

In order to catch and measure hail separate from the water, or in order to prevent the hail from melting and becoming indistinguishably mixed with the rain, some special form of gauge is needed, such as has not yet been invented and we commend this problem to the ingenuity of our readers. A layer of some soft substance at the bottom of a simple cylindrical gauge, such as we use for catching snow, would probably prevent the loss of the hail by the rebound or the breaking of the hail by a violent shock, but it would not prevent the melting of the hail by the rain that usually falls with it. As an experiment we think it would be worth while to try a separate special hail collector to consist of a cylindrical bag, 5 or 8 inches in diameter and 2 feet long, hanging freely suspended from a firm ring or hoop fastened horizontally between two posts at a few feet above the ground. The wind will deflect such a bag from the vertical, so that hail falling into it will be apt to strike the sides and glide to the bottom with diminished momentum without breaking; the rain that falls will of course pass through the bag without melting much of the hail, and, in fact, if the observer is at hand, he can rescue the hail and measure it promptly before much loss has occurred.

One of the curious phenomena with regard to hailstones is the fact that at the center each stone includes a bubble of gas under very great pressure. It is worth while to melt hailstones in a mixture of soap and water, and observe the relative diameters of the bubbles of air when inside the hailstones, and again after they have been liberated. The sudden expansion of the bubbles as they escape has been found to indicate that the air is imprisoned under a pressure of several atmospheres. This could only happen in case the hailstone is made of water that has been frozen from the outside inward, thus driving its imprisoned air to the center. Another evidence of the pressure existing within a hailstone is said to be shown by examining the optical properties of a section, as can easily be done by using a beam of polarized light.

IGNIS FATUUS OR JACK-O'-LANTERN.

This title is given to flickering flames and dancing balls of fire seen at nighttime in marshy places. The phenomenon appears to be rare in the United States, but common in some parts of Europe, probably owing largely to geological peculiarities as affecting the nature of surface soil. The light is undoubtedly caused essentially by the slow oxidation of gases containing some combination of phosphorus. Such gases, of course, result from the decomposition of animal and, more rarely, of vegetable matter. This is probably the explanation of a phenomenon recorded in the Evening News of Detroit, April 6, as having been observed near Lee, Mich. The newspaper account says:

> Between 10 and 11 o'clock the other night a bright light was seen emerging from the river [possibly the Kalamazoo River in southeastern Michigan]. On first sight it was thought to be a lantern, but further investigation proved it to be a ball of light about as large as a large hen's egg floating through the air, about 10 feet from the ground, with whizzing sound and zigzag motion. It soon disappeared.

Although, under some circumstances, there occurs a form of lightning electric discharge known as "ball lightning," yet it is not likely that this was the case in the present instance. Both the ball lightning and the ignis fatuus belong to the rare and curious phenomena of meteorology. Although they have no important relation to climatology or to dynamic meteorology, yet they are always worthy of record. From the standpoint of the electrician, ball lightning is a phenomenon whose nature is as yet totally unknown, and a satisfactory explanation thereof is greatly desired.

CURRENT WEATHER AND FUTURE CROPS.

An average state of weather is expected to produce an average crop and when some condition that seems abnormal occurs, the people are full of apprehension that the crops will be greatly diminished and of inferior quality; prices go up, speculation is rife, and the croakers have it all their own way. But after a few weeks nature restores the injury that was done, and before Thanksgiving day comes around those early fears are all dissipated by the sight of the bountiful crops. The really serious injuries to the crops almost invariably occur late in the growing season, when there is no time left to repair the damage.

Mr. J. M. Broadfield publishes several illustrations of this principle in a letter to Mr. George E. Hunt, Director of the Georgia Climate and Crop Service, and published in the Georgia Review for June 15, 1896. Mr. Broadfield says:

> The year 1818 was very fatal to all crops; no rain from the last of March till August; 1839, no rain from the 1st of April till 3d of July, and every farmer gave it up, that it was impossible to make but little, if anything. But the rains set in the 3d of July, and it rained every day for two weeks, and, to the astonishment of all, more cotton was made that year than any previous one. Corn took on new life, and a very heavy crop was made. In 1845 the drought set in about the last of March or 1st of April, and no rain till middle of August. Farmers planted corn, peas, turnips, etc., after rain set in, and made enough to fatten hogs—from the late planting. I remember we had no frost that fall till 28th of November.

April and May, 1896, were the next most remarkable departures from the normal weather conditions.

SECULAR CHANGES IN CLIMATES AND CROPS.

The meteorologist appeals to his records of observations in order to detect any change in climate, but the agriculturist naturally puts more faith in the appeal to the records of crops and vegetation. The latter may be called a practical test of the permanency of climate, but it is also very liable to be a deceptive one. The thermometer is a very simple instrument compared with a plant. The records of freezing temperatures apply directly to the climate while the records of frost-bitten plants must be interrupted by taking into consideration the nature of the plant, its stage of development, the moisture in the ground, the dryness and windiness of the air. The principal uncertainty with regard to the record of a thermometer relates to our possible ignorance of its height above the ground and the extent to which it is shielded from radiation of heat. On the whole it must be confessed that the imperfections of thermometric records are quite serious and that when it comes to a question of what the climate was fifty or a hundred years ago phenology has about as much weight as thermometry.

But any record of any climatic feature is sure to show a wide range of extremes in the course of fifty years, and the question of a real change in climate can not be settled by quoting a few such extremes. It has been well pointed out by Professor Bailey, in the Monthly Weather Review for September, 1896, p. 330, that phenological records have no special value to the botanist or botanical physiologist, but their proper use is to determine average climatological conditions. If, for instance, we knew the average date of leafing or blooming or ripening of any plant for the past fifty years, and again for the preceding fifty years, the comparisons of these averages, having proper regard to the index of annual variability, would give as clear an idea of the possible change in climate as if we had corresponding records of the temperature, sunshine, and rainfall. It is true that the climate has made the plant, and that if we knew enough about the physiology of plants, we might utilize meteorological records to explain botanical peculiarities, but, practically, we can not do this with any safety. The phenologist must be allowed to consider his observations of plants as being a record of

climate, just as the meteorologist does his observations of the atmosphere, and both of these students must be very careful about drawing hasty conclusions.

The preceding remarks are perhaps not inappropriate in connection with a letter recently received from our voluntary observer at Birdsnest, Northampton County, Va. In this letter Mr. C. R. Moore states that during the past fifty years the time of planting corn has been put back about a month, and moreover that the certainty of the peach crop has greatly decreased on account of the frequency of early frosts.

Those of our observers who have kept systematic records on this subject would do well to communicate directly with Prof. L. H. Bailey, Ithaca, N. Y., who makes a special study of phenology; meanwhile, we give Mr. Moore's letter in full:

At the request of my old friend, Prof. S. F. Baird, I began keeping the record of the weather in October, 1868, for the Smithsonian, after that for the Signal Service, and now for the Weather Bureau. My reports should all be in possession of the Government, as they were sent regularly on the 1st of each month, except it occurred on Sunday, when we have no mail. The storms are noted in all my reports by an *X* in front of the "Rain column," so that you can readily get them. In regard to the climate, it has materially changed in the last 60 years. When I came here from Philadelphia in 1867 I was told that when some of the older men were boys a man who had not finished corn planting by April Court (1st Monday) was behind. Now, if finished by May Court he is all in good time. This is not a fruit country I am sorry to say, but the old men claim that 60 years ago they had peaches every year. There were no orchards but only fruit for their own use. In 1879 I commenced setting out fruit trees. I have about 2,000, of which about 1,200 are apple trees; 200 peach; 400 plum, the rest pears, cherries, and quinces, and a few apricots. I knew that we did not have a crop of peaches more than once in five years, but I thought the apples especially would do, but they and all the rest are no better. Warm spells in February and March bring out the blossoms, and frosts in April kill them. This year a freeze, April 21 and 22, did much damage. I have never had an apricot. If the peaches blossom before April 15 we are not likely to have many. I have a memorandum of the date in which I saw the first peach blossom commencing with 1869. In 1870 my peach trees were in full bloom January 31 and we had no peaches. All the trees do well enough. You would hardly suppose that from our situation here. My place is on the seaside running east to the sounds and the Atlantic. The peninsula here is about 6 miles wide to the Chesapeake Bay on the west. My house is about one-half mile from the sounds, but we do have the frosts. The extremes of the weather here are: 100° on July 15, 1868, and + 2° on February 5, 1866; 100° on July 17, 1887; 102° on July 18, and + 2° on January, 1893.

PECULIAR MOUNTAIN STORMS.

Mr. Joseph H. Struble, of Uniontown, Pa., latitude 39° 45′ N., longitude 79° 45′ W., sends the following account of local storm phenomena, and the Editor, instead of attempting an explanation, based on too scanty data and too much theory, would lay the subject before his readers in hope that other observers in southwestern Pennsylvania and the neighboring portions of Maryland and West Virginia may contribute their own observations on this subject. Mr. Struble says:

We are located near the base of the Laurel Hill range of the mountains and what we call eastern or mountain storms frequently occur here; the wind veers from north to east and works south to west. The wind lasts usually about forty-eight hours, and in the winter season nearly always ends in rain. Persons crossing from the eastern side of the mountain say no wind is noticed until coming down from the ridge or mountain top, and the storm rarely ever reaches 6 miles west from the base of the mountain, while along the base the storm may be raging in great fury. The oldest residents here can not give any satisfactory explanation of this strange phenomenon. The ridge of the mountain runs in a northerly and southerly direction. If you can give any correct or satisfactory explanation of the cause of these mountain storms, I will consider it a very great favor.

CIRRUS CLOUDS ON THE NORTHWEST SIDE OF A STORM.

Mr. G. W. Richards, of Maple Plain, Minn., calls attention in the Northwest Weather and Crops for February, 1896, to the fact that in his neighborhood there is generally a considerable storm passing northeastward through Iowa, Illinois, Wisconsin, and Michigan, i. e., on his southeast side, whenever, at his station, the sky is clear in the northwest, but covered with cirrus to the southeast, and when the cirrus clouds are moving from south-southeast to north-northeast, or southwest to northwest, while the surface winds are northerly. A good illustration of this condition occurred between December 17 and 20, 1895, when the cirrus clouds over the southeastern sky moved toward the northeast, while the light station winds blew from west-northwest and northeast. This seems to be equivalent to saying that storm centers have clear weather on their northwest sides beyond the region of cirrus clouds. The fact that the cirri move from southwest to northeast, or from west to east, has been generally held to prove that the storm as a whole drifts along with that upper current, but this view is not yet well established, and the difficulty of theorizing on such complex matters bids us suspend judgment and hope for the time when by an extension of our kite work the Weather Bureau may be able to present *facts* in the shape of a daily map of the conditions prevailing in the cloud region throughout the United States.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Mariano Bárcena, Director, and Señor José Zendejas, vice-director, of the Central Meteorologico-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the *Boletin Mensual;* an abstract translated into English measures is here given in continuation of the similar tables published in the MONTHLY WEATHER REVIEW during 1896. The altitudes occasionally differ from those heretofore published, but no reason has been assigned for these changes. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart III.

Mexican data for May, 1897.

Stations.	Altitude.	Mean barometer.	Temperature. Max.	Temperature. Min.	Temperature. Mean.	Relative humidity.	Precipitation.	Prevailing direction. Wind.	Prevailing direction. Cloud.
	Feet.	*Inch.*	° *F.*	° *F.*	° *F.*	%	*Inch.*		
Aguascalientes	6,119	23.80	85.6	54.3	69.8	39	1.18	ne.	e.
Barousse (Coahuila)	5,413	......	83.7	54.3	71.2	......	2.20	......	......
Carneros (Coahuila)	......	......	81.5	54.1	68.7	......	1.77	......	......
Colima (Seminario)	1,656	28.27	98.1	59.5	80.6	57	1.26	ssw.	sw.
Colima	......	......	......	......	82.0	......	......	......	......
Durango	6,241	24.02	88.7	48.2	68.4	37	1.30	......	w.
Leon	5,934	20.41	91.0	49.6	71.8	40	1.73	wsw.	......
Linares	1,188	......	97.7	59.9	75.6	......	11.65	e.	......
Magdalena (Sonora)	4,948	......	90.0	68.0	78.8	......	0.08	sw.	n.
Merida	50	29.88	101.8	64.8	82.0	62	0.25	ne.	w.
Mexico (Obs. Cent.)	7,472	23.07	84.2	48.0	65.1	49	0.75	ne.	sw.
Monterey	1,626	28.15	99.5	59.0	77.9	65	3.19	ne.	ne.
Morelia (Seminario)	6,401	23.97	84.4	52.5	66.6	48	2.32	ssw.	w.
Oaxaca	5,164	25.05	92.5	50.4	73.2	65	4.96	nw.	ne.
Pachuca	7,956	22.57	84.0	40.1	60.1	49	0.18	nne.	ne.
Parras (Coahuila)	3,986	......	92.8	63.0	74.5	......	1.77	......	......
Pareta, La (Coahuila)	......	......	100.9	66.6	79.3	......	2.28	......	......
Puebla (Col. Cat.)	7,112	23.38	85.6	50.0	68.5	60	2.06	e.	ne.
Queretaro	6,070	24.17	89.1	51.3	70.2	44	0.61	e.	......
Saltillo	5,399	24.78	90.5	55.9	69.6	57	1.89	n.	sw.
San Luis Potosi	6,202	24.13	86.0	48.9	67.6	54	0.77	se.	w.
Sierra Mojada (Coah)	......	......	89.8	55.6	76.1	......	0.79	......	......
Toluca	8,612	21.91	78.8	43.9	62.2	52	1.10	ne.	......
Torreon (Coahuila)	3,720	......	100.9	72.5	84.2	......	0.39	......	......
Vaqueria (Coahuila)	......	......	81.5	55.8	64.6	......	2.36	......	......
Zacatecas	8,015	22.52	82.4	43.5	65.5	43	1.72	ne.	s.
Zapotlan (Seminario)	5,078	25.06	91.4	51.6	75.6	41	1.16	sse.	sw.

ANCHOR ICE.

The occurrence of anchor ice in European, and especially in Scotch rivers and lakes, as also in the rivers of New England, has been frequently recorded, but the first instance in our western country is recorded in the January report of the Montana Climate and Crop Service:

A curious phenomenon was witnessed on January 14, 1897, at the Black Eagle Falls of the Missouri River. For several hours the river ceased to flow, leaving the bed of the stream bare. Factories depending on water power were obliged to shut down. The cessation of the flow of water was due to anchor ice. When the temporary obstruction was overcome the water came down with a magnificent rush, leaping several feet over the edge of the dam.

The nature and method of formation of anchor ice, which is also called ground ice or "ground-gru," has not yet been thoroughly investigated, as could easily be done, by laboratory experimentation, but the various hypotheses that have been advanced concerning its formation substantially agree in the idea that we have here a case of water cooled slightly below its freezing point and prevented from freezing by the rapid current of the river; when the eddies and movements of the water cease, or become sluggish, as at the bottom surface or behind any obstacle, then it freezes, and in so doing attaches itself to the obstacle as a nucleus or base which is usually, of course, considerably below the surface of the stream.

THE CHINOOK AND THE SIGNS OF ITS APPROACH.

In the Montana Weather Report for February, 1897, Mr. Coe says:

Generally an aurora is visible from twenty-four to sixty hours prior to the chinook, and a falling barometer is nearly always in evidence. A perfectly calm and a cloudless sky precedes its coming. The smoke from fires ascends perpendicularly, wavering now and then, as if undecided in the direction it should go, or hangs suspended in the motionless air, like a miniature cloud. There is an awesome hush; all nature seems to be resting. The mountains stand out in bold relief against the intensely blue sky, the glistening whiteness of their slopes relieved by the dark green of the pine groves, presenting a lovely view. Suddenly, from each sharp peak a horizontal streamer of snow is seen to unfurl. It is the colors at the front of the advancing host, and mankind in the valleys and plains below exclaim: "The chinook is coming!"

The clouds, which immediately form at the crest of the mountains in the oncoming rush of heated air, are identical in form and color at all times—a huge, billowy mass of vapor, which seems to have been condensed at the summit of the Rockies, and rapidly rolls down the length of the Marias Pass to the plains below, very quickly hiding the mountains from sight. Sometimes the southwest wind comes in a boisterous manner, with rush and roar, chasing the snow in long, drifting lines, but soon moistening it, so that in a few hours it becomes compact and looks as if the hot breath of a flame had passed over it. At other times the atmosphere seems to quiver with heat, and the gentle breeze comes creeping and sighing in light puffs, coquettishly chasing the snow in eddies around projections, and anon tossing it in fanciful shapes on high; eventually the wind increases in force, but never varies the smallest fraction of a degree in its direction. Sometimes, above a considerable tract of country, the chinook blows only at an elevation, and descends many miles to the eastward, even melting the snow on the Sweet Grass Hills (70 miles distant) to some extent, while no change is perceptible at this point. At other times, as at present, a well-defined chinook may be "in sight" on the mountains, and continue so for hours, while the temperature is near the zero mark at this station.

To illustrate this eccentricity of the meteorological phases, I cite the following extremes between two localities, but 38 miles apart: At Kipp, elevation 4,400 feet, time 8:15 p. m. (one hundred and fifth meridian), date February 13, the record is as follows: temperature 6°, wind northwest, clear, snow on ground 7 inches. At Summit, altitude 5,500 feet, a station at the head of the Marias Pass, on the Great Northern Railway, at the same time, the report is: temperature 39, wind southwest, dense clouds, snow on ground 3 feet, melting rapidly; like conditions for the past thirteen hours. At Kipp slight change occurred in temperature until it rose to 40° in twelve minutes at 2:10 p. m., February 15, 1897.

FROST FORMATIONS.

In the American Meteorological Journal for February, 1895, page 387, Vol. XI, there is an exceedingly interesting communication from Mrs. Edson relative to the formation on Roan Mountain, Tenn., of frost needles at the surface of gravelly soil. A physical explanation of the method of formation of the ice columns was given by the Editor in the same journal for April, 1863, Vol. IX, p. 523. The subject is one that lends itself to laboratory experimentation. A peculiar type of the formation is described in the January report of the Alabama section of the Climate and Crop Service, by Mr. Alexander M. Valerio, voluntary observer at Daphne, as follows:

On January 27 the minimum temperature at this station was 14°. The next morning, going down the hillside by my house I noticed, on the dry grass and low brush, what at first sight I took for snow and nearer for bunches of cotton, but which on closer examination I found to be frost work of a very peculiar shape and form, looking very much like fine stick or ribbon candy, or fine venetian glass. These ribbons, beautifully curled and feather-like, came out from the stubs of the plants and, from a sample which I inclose, you will notice the bark was taken off the plants. The width of the frost ribbon was as the length of the cracks in the plant. They looked like fine shavings of a very white wood and crumbled at the touch.

METEOROLOGICAL TABLES.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

For text descriptive of tables and charts see page 166 of REVIEW for April, 1897.

TABLE I.—*Climatological data for Weather Bureau Stations, May, 1897.*

Stations.	Elevation of instruments: Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Pressure, in inches: Mean actual, 8 a.m. and 8 p.m. ÷ 2.	Mean reduced.	Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. and min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Departure from normal.	Days with .01, or more.	Wind: Total movement, miles.	Prevailing direction.	Maximum velocity: Miles per hour.	Direction.	Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
New England.							54.0	+0.4											4.23	+0.7											
Eastport	76	69	74	29.90	29.99	+.03	46.6	-0.5	64	5	52	32	8	41	23	44	42	89	7.88	+4.2	18	7,536	s.	32	s.	13	3	6	22	8.0	
Portland, Me.	103	81	89	29.83	29.93	-.04	52.2	-1.3	74	5	59	36	8	46	34	48	44	78	5.87	+2.3	19	5,359	s.	38	s.	23	6	4	21	7.7	
Northfield	872	15	59	29.02	29.95	-.02	51.9	-0.8	77	20	63	24	8	41	37	48	43	73	3.46	+0.3	13	6,689	n.	36	s.	23	4	12	15	6.8	
Boston	125	115	181	29.82	29.96	-.02	57.6	+1.4	76	18	66	39	8	50	30	53	49	77	4.00	+0.4	15	8,008	sw.	36	sw.	13	9	5	17	6.5	
Nantucket	14	43	54	29.98	29.99	+.01	53.6	+1.6	66	*	58	41	8	49	15	51	50	91	2.30	-1.2	15	8,952	sw.	36	se.	2	6	8	17	6.9	
Woods Hole	......	51	57	......	......	......	54.0	-0.4	65	18	59	42	8	49	19	...	...	...	3.02	-0.3	14	11,288	s.	44	s.	13	13	6	12	5.2	
Vineyard Haven	......	20	...	......	......	......	57.6	+1.1	76	10	66	42	8	50	30	...	...	...	3.28	-0.2	12	......	sw.	...	......	...	10	8	13	...	
Block Island	27	39	48	29.94	29.97	-.03	53.1	+0.8	68	18	58	42	8	48	19	50	48	86	4.31	+0.5	13	11,039	sw.	40	w.	9	8	15	8	5.6	
Narragansett Pier	......	10	...	......	......	......	55.5	+0.9	70	18	62	37	8	49	22	...	...	...	3.63	-0.4	9	......	s.	...	......	...	16	3	12	...	
New Haven	107	118	140	29.84	29.96	-.04	58.2	+1.6	81	10	67	40	5	50	28	52	47	72	5.03	+1.4	13	7,430	s.	34	e.	1	9	8	14	6.2	
Mid. Atlan. States.							61.7	-0.5											5.01	+1.3											
Albany	97	84	113	29.86	29.97	-.01	58.8	-0.5	77	9	68	38	8	49	34	52	46	67	4.69	+1.5	16	6,390	s.	36	se	20	11	8	12	5.8	
Binghamton	875	79	90	......	......	......	55.2	......	81	9	66	32	8	45	42	...	...	...	4.01	......	14	5,177	nw.	31	s.	23	7	13	11	6.2	
New York	314	298	326	29.63	29.96	-.04	59.3	-0.2	79	10	67	44	8	52	23	52	47	70	5.30	+2.1	11	10,203	nw.	48	e.	2	10	13	8	5.2	
Harrisburg	377	94	102	29.58	29.99	+.01	60.6	+0.4	79	20	70	42	8	52	27	53	46	62	5.30	+0.6	12	5,681	nw.	33	e.	1	9	9	13	6.2	
Philadelphia	117	168	184	29.85	29.97	-.05	62.6	+0.3	82	10	72	46	8	54	24	54	48	62	4.33	+1.1	12	8,494	sw.	34	se.	1	9	12	10	5.6	
Atlantic City	52	68	76	29.93	29.98	-.03	58.0	+1.0	76	18	64	45	*	52	26	54	52	82	1.71	-1.1	12	8,502	sw.	36	s.	13	9	13	9	5.0	
Baltimore	123	68	82	29.84	29.97	-.05	62.8	-1.1	84	10	72	44	4	54	31	55	48	61	6.88	+3.1	13	4,196	nw.	26	se.	1	12	8	11	5.2	
Washington	112	59	76	29.87	29.99	-.04	62.4	-1.2	83	10	72	43	3	52	30	56	51	69	6.97	+3.0	12	5,641	s.	32	n.	21	17	5	9	4.5	
Cape Henry	......	5	34	......	......	......	64.4	-0.4	86	*	72	45	4	56	32	...	...	...	5.32	+1.2	15	......	se.	...	......	...	9	6	16	...	
Lynchburg	685	83	88	29.28	30.02	+.01	63.0	-2.7	86	7	74	40	3	52	35	56	50	65	4.27	+0.4	10	3,328	nw.	24	nw.	24	9	14	8	5.4	
Norfolk	57	88	93	29.96	30.02	.00	65.3	-0.4	84	7	74	43	9	56	35	58	55	76	5.36	+1.1	15	6,484	sw.	30	sw.	13	13	6	12	5.0	
S. Atlantic States.							69.0	-1.5											2.55	-1.5											
Charlotte	773	67	76	29.19	30.00	-.02	66.6	-1.9	88	20	77	43	2	56	31	58	52	66	3.72	-0.6	12	4,898	ne.	29	s.	12	14	10	7	4.1	
Hatteras	11	17	36	30.01	30.02	-.01	66.0	-0.5	79	29	70	53	9	62	19	62	59	79	4.08	-0.5	9	10,767	sw.	47	n.	6	11	14	6	4.6	
Kittyhawk	9	12	30	29.99	30.00	-.03	63.2	-2.6	83	30	70	47	5	56	28	60	57	80	5.20	+1.5	10	12,052	ne.	47	ne.	6	13	11	7	4.1	
Raleigh	375	93	101	29.64	30.03	+.01	66.2	-1.3	86	21	76	44	4	56	29	58	52	65	2.85	-2.8	12	4,953	n.	25	n.	5	10	12	9	4.9	
Wilmington	78	82	88	29.95	30.03	+.01	68.4	-1.6	89	29	77	49	6	60	30	61	57	71	2.49	-1.7	7	6,757	s.	32	s.	13	14	15	2	3.9	
Charleston	48	60	72	30.01	30.06	+.03	72.2	-0.5	92	24	79	53	2	66	22	64	60	70	1.20	-2.8	5	8,558	s.	34	w.	13	20	10	1	3.0	
Columbia	......	5	...	......	......	......	70.4	-1.6	95	29	82	46	2	58	34	...	...	...	1.30	-2.6	7	......	ne.	...	......	...	18	6	7	...	
Augusta	180	89	103	29.83	30.02	+.02	70.8	-2.0	93	29	82	48	2	59	32	62	57	66	2.22	-1.2	5	4,928	w.	33	nw.	31	17	9	5	3.2	
Savannah	98	63	86	29.94	30.05	+.01	72.8	-0.7	94	29	82	51	2	63	28	64	59	69	1.10	-1.8	5	6,432	s.	25	w.	13	22	5	4	3.2	
Jacksonville	43	69	84	30.00	30.05	+.03	73.2	-1.9	93	29	83	53	2	64	29	66	62	74	1.35	-2.6	6	6,149	ne.	28	se.	14	24	3	4	3.5	
Florida Peninsula.							75.6	-1.6											5.15	+1.2											
Jupiter	28	13	30	30.00	30.03	+.01	74.7	-1.4	87	31	81	57	3	69	21	69	66	76	10.73	+4.9	10	8,320	s.	35	ne.	18	12	11	8	5.1	
Key West	22	42	50	30.01	30.03	+.02	77.8	-2.0	86	14	82	70	8	74	14	71	68	72	4.38	+1.2	12	8,596	e.	34	ne.	18	18	9	4	3.6	
Tampa	36	60	68	30.00	30.04	+.02	74.4	-1.4	90	26	84	55	3	65	24	66	62	70	0.33	-2.6	5	5,306	w.	24	w.	1	22	8	1	2.3	
East Gulf States.							71.7	-1.6											1.26	-2.8											
Atlanta	1,131	92	126	28.87	30.05	.00	67.9	-0.9	88	28	78	41	2	58	28	58	51	59	0.34	-3.2	3	6,963	nw.	36	w.	2	13	12	6	3.8	
Pensacola	56	78	90	30.00	30.06	+.04	71.7	-2.4	86	22	80	51	2	64	25	65	60	69	1.26	-2.1	5	6,874	sw.	26	sw.	3	18	9	4	3.4	
Mobile	57	88	96	30.00	30.06	+.05	71.2	-2.9	87	22	81	52	2	62	27	63	58	68	3.54	-0.8	6	5,661	n.	32	nw.	14	24	5	2	2.9	
Montgomery	221	100	107	29.80	30.03	+.01	71.1	-2.2	91	*	82	47	2	60	32	62	56	61	0.68	-3.4	4	4,697	ne.	25	nw.	4	22	7	2	2.1	
Vicksburg	254	65	73	29.76	30.03	+.03	71.4	-1.6	87	29	80	54	2	62	26	61	55	62	0.89	-4.0	6	4,352	nw.	26	s.	8	21	9	1	2.6	
New Orleans	54	112	120	30.00	30.06	+.07	74.3	-0.8	88	21	82	58	*	66	23	65	60	67	0.25	-4.6	4	5,864	se.	32	n.	14	17	9	5	3.7	
Port Eads	......	27	...	......	......	......	74.3	-0.3	85	31	80	59	*	69	16	...	...	...	1.87	-1.4	3	......	e.	...	......	...	22	7	2	...	
West Gulf States.							72.5	-0.7											2.61	-1.8											
Shreveport	249	77	84	29.77	30.03	+.05	72.3	-2.0	89	24	83	53	1	62	27	63	58	66	3.29	-0.9	7	3,782	se.	22	s.	10	18	4	9	4.2	
Fort Smith	481	63	72	29.52	30.02	+.08	69.2	-0.1	89	27	80	47	2	58	33	61	56	66	2.90	-1.8	9	4,064	e.	20	e.	22	18	5	8	4.1	
Little Rock	302	71	79	29.74	30.06	+.08	68.9	-1.4	90	28	79	49	2	59	28	59	53	62	1.15	-4.6	8	4,088	n.	23	nw.	28	17	6	8	4.4	
Corpus Christi	20	42	50	29.99	30.01	+.04	75.8	+0.1	88	13	80	60	2	72	22	71	69	80	2.28	-1.0	6	9,539	se.	48	n.	13	10	20	1	4.3	
Galveston	42	85	96	30.01	30.05	+.07	74.8	-1.2	83	31	79	62	1	71	13	70	67	80	1.27	-2.6	5	6,357	se.	24	n.	1	20	9	2	3.2	
Palestine	510	54	61	29.50	30.04	+.05	71.8	-0.2	89	25	82	48	2	62	33	64	60	73	4.27	-1.6	11	3,702	se.	20	se.	5	12	13	6	4.7	
San Antonio	704	95	104	29.28	30.00	+.05	74.8	-0.2	90	23	85	56	*	64	27	65	61	68	3.13	-0.1	8	5,762	se.	42	se.	7	10	12	9	5.3	
Ohio Val. & Tenn.							61.3	-3.9											3.35	-0.5											
Chattanooga	762	106	112	29.26	30.06	+.04	65.8	-2.5	87	28	76	42	2	56	33	57	50	61	3.26	-0.9	7	5,160	sw.	32	sw.	2	13	13	5	4.7	
Knoxville	980	80	88	29.02	30.06	+.03	63.2	-3.0	87	8	74	41	2	53	33	55	49	64	6.11	+2.2	14	3,944	w.	24	w.	23	15	5	11	4.6	
Memphis	399	140	154	29.63	30.06	+.07	68.2	-1.8	90	28	77	48	1	59	26	58	51	58	1.37	-3.2	8	6,157	sw.	26	w.	13	17	10	4	3.8	
Nashville	545	128	134	29.48	30.05	+.06	64.4	-3.6	87	28	75	40	2	54	32	55	49	62	1.22	-2.4	7	4,605	nw.	28	nw.	1	17	9	5	3.6	
Lexington	989	75	122	28.98	30.03	+.06	59.4	-4.0	87	8	68	33	2	50	34	53	48	68	4.48	+1.0	13	7,560	nw.	38	s.	23	13	7	11	5.3	1.5
Louisville	525	114	136	29.48	30.05	+.06	61.6	-4.5	90	8	72	37	2	51	33	53	47	64	3.30	-0.4	12	5,480	s.	31	w.	15	11	9	11	5.2	
Indianapolis	823	154	164	29.16	30.04	+.04	58.0	-4.9	85	8	68	34	2	48	30	53	45	75	4.37	+0.2	16	6,419	nw.	45	w.	20	15	11	5	4.2	2.4
Cincinnati	628	152	157	29.37	30.04	+.05	59.5	-5.0	84	8	69	33	2	50	29	52	46	65	2.46	-1.0	10	5,220	nw.	33	w.	23	13	10	8	4.5	1.5
Columbus	824	87	100	29.14	30.02	+.03	57.9	-3.8	82	8	68	33	2	48	32	52	48	72	3.68	-0.6	11	4,773	w.	30	w.	23	11	9	11	5.1	T.
Pittsburg	842	116	126	29.11	30.01	+.01	58.0	-4.5	81	23	68	37	2	48	31	53	49	73	2.70	-0.7	15	4,482	w.	28	s.	1	8	13	10	5.5	
Parkersburg	638	77	84	29.35	30.04	+.04	58.6	-4.9	85	9	70	35	2	48	36	53	48	70	3.95	0.0	11	4,436	nw.	34	nw.	24	10	11	10	5.2	
Lower Lake Region.							54.8	-1.4											3.08	-0.4											
Buffalo	768	178	206	29.14	29.96	-.02	53.8	+0.1	75	11	61	41	3	47	24	48	43	70	2.62	-0.8	13	10,116	w.	48	w.	14	6	16	9	6.2	
Oswego	335	76	87	29.58	29.94	-.05	53.4	-0.4	78	*	61	37	8	46	35	48	43	72	2.76	-0.1	13	7,023	w.	42	se.	2	8	7	16	6.2	
Rochester	523	81	90	29.39	29.96	-.02	55.5	0.0	82	23	65	36	8	46	33	49	43	67	1.33	-2.0	13	5,610	sw.	26	sw.	25	9	10	12	5.9	
Erie	714	92	102	29.22	29.98	.00	53.7	-2.0	79	9	61	40	22	46	25	48	47	80	3.04	-0.8	13	7,098	w.	40	sw.	14	12	8	11	5.3	
Cleveland	762	190	201	29.17	29.99	-.01	54.8	-1.9	80	9	62	38	22	47	28	49	45	72	3.73	+0.1	13	9,120	nw.	40	nw.	14	10	10	11	6.1	
Sandusky	629	62	74	29.32	29.99	-.01	56.6	-1.9	83	9	64	37	22	48	29	50	44	67	3.84	+0.4	13	6,121	sw.	32	sw.	9	8	7	16	6.2	
Toledo	674	122	127	29.27	29.99	+.01	56.0	-2.7	80	9	65	35	2	49	30	50	45	71	3.28	-0.1	15	6,667	w.	28	sw.	14	8	10	13	5.7	
Detroit	730	160	166	29.20	29.99	.00	54.8	-2.8	79	9	63	36	2	47	29	50	45	74	4.03	+0.5	10	6,458	sw.	33	sw.	12	8	12	11	5.8	
Upper Lake Region.							50.8	-0.5											2.55	-0.8											
Alpena	609	61	65	29.30	29.97	.00	48.6	-0.4	80	9	56	34	1	41	29	44	41	77	5.43	+2.0	17	6,808	nw.	35	sw.	9	7	13	11	6.2	
Grand Haven	628	55	64	29.30	29.98	+.02	51.2	-2.7	82	8	60	34	1	43	34	46	42	72	1.18	-2.2	11	7,625	nw.	31	sw.	20	10	13	8	5.1	T.
Marquette	734	67	95	29.17	29.96	-.02	47.6	-0.4	78	17	55	32	1	40	29	43	38	71	1.89	-1.1	16	7,371	nw.	34	nw.	28	6	13	12	6.7	T.
Port Huron	620	70	108	29.30	29.99	+.01	53.2	+0.8	80	19	62	36	31	44	32	47	43	73	4.32	+1.0	15	7,264	s.	36	w.	12	10	11	10	5.3	
Sault Ste. Marie	624	58	65	29.28	29.96	+.02	45.8	-1.2	72	17	55	30	16	36	36	41	36	73	4.26	+2.0	14	6,520	nw.	35	w.	24	11	7	13	5.9	T.
Chicago	824	241	274	29.14	30.02	+.05	55.0	-1.3	81	19	63	33	1	47	38	48	42	66	0.84	-2.9	10	12,155	n.	49	n.	2	12	14	5	4.3	
Milwaukee	671	106	149	29.29	30.01	+.03	53.7	+0.3	83	18	63	32	1	44	33	48	42	69	1.01	-2.6	7	6,896	w.	35	w.	23	11	6	14	5.6	0.1
Greenbay	617	49	57	29.33	30.00	+.02	53.8	+0.4	84	5	64	32	1	44	36	47	41	67	2.40	-1.4	9	6,635	s.	32	n.	2	10	15	6	5.5	T.
Duluth	702	95	106	29.24	30.00	+.04	48.4	+0.2	87	17	57	32	1	40	41	42	35	64	1.63	-2.0	13	6,747	ne.	36	ne.	18	10	12	9	5.0	T.
North Dakota.							57.0	+3.1											0.87	-1.5											
Moorhead	935	54	60	28.98	29.98	+.05	56.2	+3.1	90	17	70	26	24	42	48	42	38	62	0.80	-1.7	10	8,290	se.	38	se.	25	13	12	6	4.3	
Bismarck	1,674	16	29	28.23	29.99	+.10	57.2	+2.9	90	4	71	28	14	43	43	47	41	53	1.10	-1.4	6	8,333	nw.	36	nw.	8	19	11	1	3.5	
Williston	1,875	15	31	27.98	29.94	+.05	57.6	+3.3	90	*	72	25	13	43	45	48	38	54	0.72	-1.4	6	7,493	n.	48	w.	8	22	8	1	3.2	
Upper Miss. Valley.							59.9	-1.1											1.77	-2.3											
Minneapolis	......	99	...	......	......	......	57.4	+0.9	87	5	69	31	1	46	38	...	...	...	1.87	-1.8	10	......	w.	...	......	...	15	7	9	...	
St. Paul	837	114	124	29.10	30.00	+.07	56.8	-0.4	86	5	68	34	1	46	34	47	38	55	1.81	-1.6	10	5,797	nw.	31	s.	26	11	8	12	5.2	
La Crosse	......	70	78	......	......	......	57.4	-0.6	87	6	68	34	1	46	37	...	...	...	1.59	-1.7	6	5,771	s.	39	w.	10	11	10	10	5.0	
Davenport	599	71	79	29.36	30.00	+.03	59.6	-0.8	82	7	70	36	1	49	29	51	43	57	1.91	-2.4	10	5,415	nw.	36	nw.	23	13	11	7	4.5	
Des Moines	867	84	88	29.13	30.06	+.12	59.7	-1.5	83	6	71	39	*	48	35	51	43	58	2.31	-2.4	7	5,884	n.	37	sw.	19	18	9	4	3.3	
Dubuque	698	49	56	29.26	30.01	+.05	58.7	-0.5	84	6	70	35	1	46	30	50	41	57	2.09	-1.9	7	5,544	w.	28	nw.	20	22	7	2	2.5	
Keokuk	614	64	78	29.38	30.03	+.08	61.2	-1.0	85	20	71	35	2	51	31	52	46	60	1.86	-2.2	7	5,359	nw.	36	nw.	13	18	10	3	2.9	
Cairo	359	87	93	29.66	30.05	+.09	64.6	-2.5	85	22	74	42	1	56	27	57	52	68	1.12	-2.7	8	5,184	n.	32	n.	24	10	12	9	4.9	

TABLE I.—*Climatological data for Weather Bureau Stations, May, 1897*—Continued.

Stations.	Elevation of instruments: Barometer above sea level, feet.	Elevation of instruments: Thermometers above ground.	Elevation of instruments: Anemometers above ground.	Pressure, in inches: Mean actual, 8 a. m. and 8 p. m. ÷ 2.	Pressure, in inches: Mean reduced.	Pressure, in inches: Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. and min. ÷ 2.	Temperature: Departure from normal.	Temperature: Maximum.	Temperature: Date.	Temperature: Mean maximum.	Temperature: Minimum.	Temperature: Date.	Temperature: Mean minimum.	Temperature: Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Precipitation: Departure from normal.	Precipitation: Days with .01, or more.	Wind: Total movement, miles.	Wind: Prevailing direction.	Wind: Maximum velocity: Miles per hour.	Wind: Maximum velocity: Direction.	Wind: Maximum velocity: Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
Up. Miss. Val.—Con																															
Springfield, Ill.	644	82	92	29.35	30.03	+ .04	59.9	− 2.5	82	20	70	36	1	50	36	52	45	62	2.19	− 2.8	7	6,264	s.	26	sw.	20	13	14	4	4.5	
Hannibal	534	75	107	...	...	...	61.0	...	84	22	72	40	31	50	33	...	...	...	1.13	− 2.9	8	6,058	sw.	33	sw.	8	17	12	2	3.1	
St. Louis	567	111	210	29.46	30.06	+ .10	63.5	− 2.5	84	22	72	43	2	55	29	57	53	73	1.59	− 3.0	9	6,457	s.	29	sw.	20	17	8	6	4.0	
Missouri Valley.							61.5	+ 0.4											1.66	− 2.8											
Columbia	...	4	84	...	...	...	62.7	+ 0.1	86	22	75	38	2	50	38	...	...	...	3.19	− 2.7	9	5,307	nw.	30	nw.	13	13	8	10	5.2	
Kansas City	963	78	95	29.04	30.06	+ .12	64.5	0.0	87	20	74	41	14	54	30	54	46	57	1.24	− 3.4	10	5,468	n.	29	nw.	13	12	14	5	4.3	
Springfield, Mo.	1,324	100	103	28.65	30.04	+ .08	63.4	− 3.8	84	27	72	39	14	54	26	55	49	65	2.48	− 3.6	7	6,412	se.	30	sw.	27	9	18	4	4.3	
Topeka	...	81	...	...	...	...	64.6	+ 2.1	90	26	76	38	14	53	36	...	...	...	2.43	− 3.0	9	...	n.	...	...	...	9	17	5	...	
Lincoln	1,199	74	84	28.76	30.02	...	60.8	− 0.3	88	26	73	34	24	48	35	55	51	72	2.22	− 2.6	11	7,565	se.	38	nw.	13	10	19	2	4.6	
Omaha	1,103	92	97	28.86	30.03	+ .08	61.8	− 0.2	87	19	72	38	14	51	31	53	46	61	2.16	− 2.2	11	5,762	se.	26	nw.	23	16	11	4	4.0	
Sioux City	1,139	96	109	...	...	...	59.1	+ 1.4	88	19	72	35	24	46	42	...	...	...	1.24	− 2.2	7	9,480	s.	44	nw.	23	16	5	10	4.2	
Pierre	1,460	50	61	28.43	29.96	+ .07	60.9	+ 3.4	90	16	74	31	14	48	41	50	40	51	0.45	− 1.9	5	7,980	se.	40	s.	7	16	10	5	3.7	
Huron	1,310	63	72	28.62	30.00	+ .07	56.8	+ 1.3	87	5	71	27	24	43	44	50	43	60	0.46	− 2.6	5	9,826	se.	40	se.	25	11	18	2	4.0	
Yankton	1,234	51	57	28.71	30.01	+ .09	60.1	+ 0.1	86	19	72	32	24	48	40	50	41	54	0.78	− 3.6	8	7,389	s.	31	nw.	23	14	11	6	3.9	
Northern Slope.							59.6	+ 5.6											1.17	− 1.2											
Havre	2,494	15	33	27.31	29.88	− .03	60.6	+ 7.3	89	16	76	35	10	46	44	49	37	49	0.42	− 1.1	7	7,889	w.	47	sw.	25	17	10	4	3.9	
Miles City	2,372	41	49	27.45	29.89	− .02	63.5	+ 7.1	92	16	77	36	14	50	41	50	38	48	0.35	− 1.9	7	5,952	se.	48	w.	7	16	9	6	3.5	
Helena	4,108	88	93	25.85	29.98	+ .05	60.0	+ 7.0	83	14	72	35	7	48	35	47	34	44	1.14	− 0.4	7	6,430	sw.	48	sw.	25	17	10	4	3.7	T
Rapid City	3,251	53	61	26.63	29.94	+ .01	59.8	+ 6.7	88	25	73	31	14	47	40	49	36	46	1.82	− 1.8	7	6,371	se.	36	se.	24	13	12	6	4.5	
Cheyenne	6,105	58	60	24.07	29.98	+ .06	55.0	+ 3.7	79	25	68	28	9	42	39	44	33	53	3.07	+ 0.8	15	6,588	s.	35	sw.	21	7	17	7	5.7	
Lander	5,372	28	36	24.68	29.97	+ .05	57.6	+ 5.7	82	31	73	29	9	42	40	46	33	48	1.25	− 1.4	9	3,964	sw.	36	sw.	7	5	21	5	5.5	
North Platte	2,826	43	52	27.11	30.01	+ .09	60.4	+ 1.9	87	19	74	28	14	47	37	52	45	61	0.11	− 2.6	4	7,341	se.	46	s.	18	14	17	0	3.6	
Middle Slope.							63.4	+ 0.8											2.87	− 0.7											
Denver	5,290	83	151	24.78	29.99	+ .07	60.6	+ 4.0	84	31	74	40	11	48	34	49	40	54	3.15	+ 0.3	9	5,472	s.	42	n.	26	6	17	8	5.7	
Pueblo	4,713	74	81	25.30	29.96	+ .08	61.6	+ 1.9	90	31	76	38	1	47	42	49	38	50	1.93	+ 0.1	10	5,619	nw.	38	nw.	21	10	16	5	4.8	
Concordia	1,398	42	47	28.55	30.02	+ .07	63.2	+ 0.7	89	26	76	35	14	51	42	54	46	60	2.13	− 2.1	9	5,434	s.	24	s.	26	11	16	4	4.8	
Dodge City	2,504	44	52	27.42	29.99	+ .10	64.4	+ 1.0	87	31	76	39	3	53	36	56	51	70	1.49	− 1.7	10	8,010	s.	40	s.	31	10	19	2	4.2	
Wichita	1,351	78	85	28.61	30.03	+ .13	65.1	− 0.7	88	*	76	40	14	54	36	56	49	63	2.48	− 1.5	9	5,466	s.	24	w.	21	9	12	10	5.0	
Oklahoma	1,218	54	53	28.75	30.02	+ .12	65.8	− 2.1	85	*	75	42	1	57	30	60	56	76	6.02	+ 0.7	12	6,950	s.	48	nw.	13	18	10	3	3.8	
Southern Slope.							66.8	− 0.8											4.58	+ 1.8											
Abilene	1,749	47	54	28.21	30.02	+ .10	70.4	− 1.4	89	22	80	48	1	60	28	61	57	70	4.73	+ 1.2	10	6,887	se.	46	nw.	10	7	15	9	5.2	
Amarillo	3,691	53	61	26.29	30.01	+ .10	63.3	− 0.1	82	26	74	45	4	53	30	56	51	72	4.44	+ 2.4	11	10,975	s.	44	n.	27	2	14	15	6.9	
Southern Plateau.							72.2	+ 1.7											1.20	+ 0.8											
El Paso	3,767	10	110	26.14	29.86	+ .01	74.0	+ 0.7	94	*	88	51	5	60	36	54	34	32	0.46	0.0	4	8,264	e.	48	s.	25	17	11	3	3.2	
Santa Fe	6,998	47	50	23.32	29.97	+ .06	56.9	+ 0.6	74	17	67	36	4	46	27	46	35	52	4.35	+ 3.3	15	5,019	se.	36	sw.	1	12	15	4	4.8	
Phœnix	1,076	47	57	28.66	29.77	...	77.5	+ 2.9	104	28	94	52	3	61	39	56	37	28	0.01	− 0.2	1	3,454	e.	26	nw.	29	24	3	4	1.8	
Yuma	139	16	50	29.62	29.76	− .08	80.4	+ 2.6	102	28	96	54	2	65	41	60	43	32	T.	0.0	0	4,389	s.	36	w.	2	26	5	0	1.3	
Middle Plateau.							61.2	+ 5.2											0.63	− 0.5											
Carson City	4,720	82	92	25.26	29.95	...	59.4	+ 4.5	85	28	74	29	8	45	43	46	31	42	0.23	− 0.4	5	5,635	nw.	47	w.	6	15	14	2	3.8	
Winnemucca	4,340	59	70	25.66	29.95	+ .02	60.8	+ 6.9	90	29	75	29	8	46	39	47	31	40	0.69	− 0.3	8	6,479	sw.	48	ne.	24	8	15	8	5.1	
Salt Lake City	4,344	83	90	25.62	29.94	+ .01	63.4	+ 4.1	88	29	76	35	8	51	35	53	43	52	0.98	− 0.7	6	5,020	se.	40	s.	1	7	11	13	6.4	
Northern Plateau.							61.1	+ 5.0											1.11	− 0.4											
Baker City	3,470	49	47	26.46	29.99	+ .04	58.2	+ 5.1	88	29	71	31	2	45	41	47	36	53	1.55	− 0.4	6	5,095	s.	29	sw.	16	10	13	8	5.0	0.1
Idaho Falls	4,742	10	56	25.25	29.98	+ .05	58.6	+ 7.0	89	30	74	27	8	43	41	45	31	41	0.84	− 0.1	6	6,865	s.	51	s.	25	18	9	4	3.3	
Spokane	1,943	99	107	27.95	29.97	+ .02	62.4	+ 5.6	95	29	76	37	*	49	38	51	42	54	1.01	− 0.4	6	4,726	sw.	32	sw.	6	17	6	8	4.1	
Walla Walla	1,018	65	73	28.93	29.99	+ .05	65.3	+ 2.5	100	29	78	40	*	52	38	54	44	51	1.05	− 0.6	8	4,289	s.	34	n.	29	16	11	4	3.9	
N. Pac. Coast Reg.							60.0	+ 1.6											1.71	− 1.1											
Fort Canby	179	10	34	29.87	30.07	+ .05	54.1	+ 1.5	85	12	60	43	2	48	31	50	47	83	1.85	− 1.3	13	8,411	n.	57	s.	6	11	9	11	5.4	
Port Angeles	29	47	61	...	...	...	51.8	+ 1.2	78	28	59	38	2	44	30	...	...	...	0.63	− 0.7	6	5,517	w.	30	w.	29	14	11	6	4.4	
Pysht	...	5	...	...	...	...	54.8	...	83	28	66	38	1	43	39	...	...	...	1.88	− 0.7	11	...	w.	...	...	...	14	10	7	...	
Seattle	119	100	108	29.93	30.06	...	58.4	...	90	28	68	42	2	49	34	51	45	66	1.30	...	7	3,710	nw.	34	sw.	6	12	9	10	4.9	
Tacoma	213	...	...	...	...	...	57.2	...	88	28	67	40	2	48	33	...	...	...	1.46	...	8	...	...	...	...	...	12	5	14	5.4	
Tatoosh Island	86	12	21	30.00	30.10	+ .09	50.7	+ 0.2	67	13	55	43	*	46	18	48	46	83	3.45	− 1.1	12	7,363	sw.	55	e.	28	11	8	12	5.7	
Astoria	...	39	60	...	...	...	57.3	+ 2.0	80	12	65	40	2	50	28	...	...	...	2.38	− 1.2	10	...	w.	...	...	...	17	3	11	...	
Portland, Oreg	153	203	213	29.88	30.04	− .01	61.4	+ 1.9	93	28	72	40	8	51	35	52	45	62	0.90	− 1.5	8	6,154	nw.	37	s.	6	10	18	3	4.2	
Roseburg	521	56	67	29.46	30.02	− .04	60.4	+ 2.7	92	12	73	36	8	48	41	51	45	66	0.89	− 1.1	8	3,073	nw.	24	sw.	6	14	11	6	4.4	
Mid. Pac. C'st Reg.							60.7	+ 1.5											0.35	− 1.3											
Eureka	64	60	69	30.01	30.07	+ .05	52.8	− 0.7	70	11	58	39	2	47	22	50	48	90	0.75	− 2.3	7	5,321	nw.	32	nw.	25	9	16	6	5.3	
Redbluff	334	54	58	29.57	29.91	− .03	72.6	+ 4.7	98	19	86	46	7	59	34	56	43	41	0.06	− 1.3	2	5,586	se.	26	se.	5	25	6	0	1.8	
Sacramento	71	106	117	...	...	...	67.0	+ 2.2	93	19	79	45	5	55	37	...	...	...	0.30	− 0.7	1	8,314	sw.	33	nw.	10	23	8	0	2.4	
San Francisco	153	161	167	29.82	29.98	− .02	57.4	− 0.6	88	19	64	47	5	51	30	52	49	80	0.61	− 0.1	2	10,048	w.	45	w.	11	13	16	2	4.1	
Point Reyes Light	...	12	...	...	...	...	53.9	+ 1.8	81	19	60	44	8	48	29	...	...	...	0.02	− 1.9	1	...	nw.	...	...	...	13	6	12	...	
S. Pac. Coast Reg.							65.1	+ 0.7											0.07	− 0.3											
Fresno	332	67	70	29.52	29.86	− .04	71.7	+ 3.5	99	20	88	45	2	56	39	56	44	45	0.00	− 0.4	0	5,019	nw.	24	nw.	28	24	7	0	1.7	
Los Angeles	330	74	76	29.60	29.95	− .01	62.6	− 0.6	76	9	71	48	*	54	26	56	54	82	0.10	− 0.3	3	3,141	w.	20	n.	14	2	22	7	5.5	
San Diego	69	59	70	29.85	29.95	− .03	60.9	− 0.9	67	*	64	50	2	58	11	56	54	81	0.12	− 0.2	5	4,413	nw.	23	se.	2	15	4	12	5.1	
San Luis Obispo	201	10	46	29.77	29.99	...	61.2	...	90	9	73	41	27	50	40	53	48	69	0.04	...	1	3,902	w.	28	w.	1	12	6	13	5.1	

NOTE.—The data at stations having no departures are not used in computing the district averages. Letters of the alphabet denote number of days missing from the record. * Two or more directions, dates, or years. † Received too late to be considered in departures, etc.

TABLE II.—*Meteorological record of voluntary and other cooperating observers, May, 1897.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	Ins.	Ins.
Alco †	91	42	70.0	1.15	
Ashville †	95	38	68.2	1.62	
Bermuda †	92	42	69.5	1.07	
Birmingham	90	43	70.0	3.98	
Brewton †	93	44	69.5	0.50	
Bridgeport †				5.72	
Citronelle †	90	49	72.4	0.68	
Clanton †	89	42	67.8	0.40	
Cordova †				3.99	
Daphne †	91	45	71.6	1.61	
Decatur †	92	36	66.3	3.30	
Demopolis	92	42	69.6	0.80	
Elba †	93	40	68.6	1.20	
Eufaula *a* †	97	48	72.4	1.85	
Evergreen †	87	42	67.0	1.10	
Florence *a* †				2.56	
Florence *b* †	90	40	66.6	2.19	
Fort Deposit †	94	46	71.2	T.	
Gadsden	94	39	68.4	1.51	
Goodwater †	92	40	69.3	0.10	
Greensboro †	90	45	69.2	1.09	
Hamilton	92	36	66.2	2.09	
Healing Springs †	91	42	68.4	2.14	
Highland Home † *	88	50	71.2	0.20	
Livingston	93	42	70.8	0.47	
Lock No. 4	91	39	67.4	1.72	
Madison Station †	91	35	65.2	4.42	
Maple Grove	92	32	64.4	0.75	
Marion †	90	46	70.4	1.00	
Mount Willing †	94	39	69.3	0.57	
Newbern †	88	44	70.6	1.61	
Newburg	92	40	66.2	1.53	
Newton †	91	43	69.4	1.68	
Opelika †	94	42	69.4	1.03	
Oxanna †	87	37	65.4	1.73	
Pineapple	95	49	71.0	0.60	
Pushmataha †	91	46	70.7	1.54	
Rockmills †	88	38	65.8	0.40	
Scottsboro †	92	36	65.6	5.63	
Selma †	92	45	70.6	0.73	
Sturdevant †				0.42	
Talladega *[1]	88	50	68.9	1.74	
Tallassee †				1.39	
Thomasville	74	44	71.2	0.77	
Tuscaloosa †	91	45	70.3	2.71	
Tuscumbia	91	40	67.2	1.61	
Union †	95	40	69.1	1.44	
Union Springs †	94	46	71.6	1.15	
Uniontown †	90	49	72.0	1.07	
Valleyhead	86	33	64.7	3.94	
Warrior †				0.69	
Wetumpka	92	43	69.1	0.93	
Wilsonville †				0.90	
Arizona.					
Arizona Canal Co. Dam	106	50	77.6	0.08	
Benson *[8]	95	63	77.7	0.00	
Bisbee †	89	45	70.0	0.05	
Buckeye †	104	50	76.8	T.	
Calabasas	96	48	70.9	0.01	
Casa Grande *[8]	110	60	80.8	0.00	
Cedar Springs				0.53	
Congress	97	49	76.2	0.14	
Dragoon				0.95	
Dragoon Summit *[5]	91	60	75.3	0.33	
Dudleyville	100	42	73.2	0.28	
Farleys Camp †	106	52	79.4	T.	
Flagstaff †	84	34	61.0	0.12	
Fort Apache	89	32	62.8	0.34	
Fort Grant †	92	40	70.6	0.04	
Fort Huachuca †	92	43	68.6	0.26	
Fort Mohave		57		0.00	
Gilabend *a* *[8]	107	67	85.8	0.00	
Glendale	103	45	74.1	0.00	
Holbrook †	90	38	63.8	0.13	
Lochiel *[1]	92*z*	48*z*	66.6*z*	0.32	
Maricopa *[8]	108	63	88.1	0.00	
Mesa †	103	48	77.0	0.16	
Mount Huachuca	92	40	69.4	0.16	
Music Mountain	95	49	74.3	0.07	
Natural Bridge				0.27	
Oracle †	93	43	71.9	0.04	
Oro				0.13	
Oro Blanco	97	44	72.3	0.35	
Pantano *[8]	100	60	75.8	0.00	
Parker	112	48	80.8		
Payson				0.18	
Peoria †	100	51	76.4	T.	
Phœnix	100	48	75.6	0.00	
Pinal Ranch				0.26	
Reymert †	107	49	79.4	T.	
St. Helena Ranch				0.29	
San Carlos †	102	43	73.2	0.30	
San Simon *[8]	96	55	75.9	0.00	
Showlow				0.07	
Signal †	106	51	77.2	T.	
Texas Hill *[8]	108	61	85.1	0.00	
Arizona—Cont'd.	°	°	°	Ins.	Ins.
Tombstone	92	43	72.4	T.	
Tuba	94	40	65.4	0.26	
Tucson *c* †	98	52	75.6	0.00	
Walnut Ranch *†[1]	87	50	65.7	0.48	
Whipple Barracks †	92	35	61.4	0.19	
Willcox *[8]	88	58	72.4	0.00	
Williams	86	34	57.9	0.85	
Arkansas.					
Amity	89	45	68.5	1.65	
Arkansas City †				7.47	
Batesville	91	44	66.4	1.07	
Beebranch †	92	43	66.9	1.25	
Blackton				1.75	
Blanchard Springs †	91	44	69.0	1.40	
Brinkley	91	44	68.0	2.35	
Camden *a* †				2.77	
Camden *b* †	93	42	68.6	2.78	
Canton *[14]	90	40	64.8		
Conway	95	43	70.1	1.44	
Corning †	90	42	66.1	2.79	
Dallas	91	40	69.2	2.41	
Dardanelle				2.09	
Elon †	90	41	71.0	2.89	
Fayetteville †	87	38	65.0	0.67	
Forrest	91	44	68.0	1.13	
Fulton †				3.83	
Helena *a* †				0.44	
Helena *b*	93	48	70.6	0.34	
Hot Springs *a*	93	45	70.6	2.22	
Hot Springs *b*				1.63	
Hot Springs (near)				1.69	
Jonesboro	91	33	66.4	1.81	
Keeseos Ferry †	92	38	66.0	2.24	
Lacrosse †	98	39	64.4	1.15	
Lonoke *[1]	92	49	69.3	0.38	
Luna Landing *[8]	86	53	69.9	4.57	
Lutherville *[1]	99	51	70.6		
Malvern †	96	43	69.2	1.72	
Marianna *[1]	95	53	72.0		
Marvell	95	46	69.7	0.85	
Moore	92	48	74.2	1.05	
Mossville	85	43	65.9	2.96	
Mount Nebo †	87	45	66.9	1.08	
New Gascony *[1]	86	51	69.9	1.55	
Newport *a* †				3.11	
Newport *b* †	90	44	65.8	2.94	
Newport *c* †	93	42	67.3	3.14	
Oregon *[1]	82	36	60.2		
Osceola †	89	45	67.3	1.84	
Ozark †	90	49	70.9	1.15	
Picayune †	90	47	71.0	3.81	
Pinebluff †	94	45	70.6	1.56	
Pocahontas †	85	41	65.9	3.05	
Prescott	92	45	70.7	2.72	
Russellville	91	44	68.4	1.17	
Silver Springs †	88	34	62.8	1.86	
Stamps	92	47	71.7	1.72	
Stuttgart †	91	44	68.2	1.52	
Texarkana †	94	47	72.0	4.31	
Warren †	98	47	69.2	3.50	
Washington *†[1]	92	48	69.7	4.12	
Wiggs *[1]	89	48	69.7	2.07	
Witts Springs †	87	42	63.6	0.81	
California.					
Adin	93	30	60.6	0.88	
Agnew	92	34	59.6	0.00	
Arlington Heights	93	44	65.8	0.02	
Athlone *[8]	98	51	75.1	0.00	
Azusa				0.28	
Ballast Point L. H				0.05	
Barstow †	100	65	81.2	0.00	
Bear Valley †				0.80	
Berkeley	91	48	60.3	0.20	
Bishop †	92	35	63.4	0.12	
Bishop Creek *[8]	95	50	74.6	0.18	
Boca *[8]	85	29	53.7	0.50	
Bodie †	79	18	48.0	0.51	
Bowmans Dam *†[1]	79	34	55.8	0.92	
Caliente *[8]	95	55	74.8	0.13	
Calloway Canal *†[8]	100	43	72.4	0.06	
Campbell	93	35	61.6	0.06	
Cape Mendocino L. H				0.45	
Castle Pinckney *[1] *j*	76	50	57.8	T.	
Cedarville †	88	30	58.9	0.80	
Centerville *[1]	98	53	64.4	0.16	
Chico *[8]	98	53	74.8	0.18	
Chino *†[8]	89	52	64.5	0.00	
Cisco *[8]	75	30	46.1		
Claremont †	85	42	62.0	0.21	
Corning *[8]	98	55	72.7	T.	
Coronado	75	55	65.4	0.12	
Craftonville	96	46	68.2	0.56	
Crescent City †	85	34	53.4	0.85	
Crescent City L. H				1.24	
Daunt				1.85	
Davisville *b*	93	47	68.7	0.12	
California—Cont'd.	°	°	°	Ins.	Ins.
Delano *[8]	95	50	72.0	0.00	
Delta *[8]	99	47	70.9	0.00	
Descanso *[5]	84	28	56.2	0.21	
Drytown	93	38	64.3	0.30	
Dunnigan *[8]	92	58	75.0	0.26	
Durham *[1]	90	48	67.3	0.17	
East Brother L. H				0.25	
Edmanton *[1]	86	32	56.5	0.06	
Elsinore	97	45	70.0	0.03	
Escondido	91	38	65.8		
Fallbrook *[1]	84	48	62.5	0.21	
Famosa †	96	46	73.8	0.00	
Folsom City *b* *[1]	99	56	71.3	0.51	
Fordyce Dam †				2.47	
Fort Bragg †				0.62	
Fort Ross	76	40	55.4	0.86	
Glendora				0.45	
Goshen *[8]	100	48	70.6	0.00	
Grand Island *[5]	94	49	70.8	0.30	
Grass Valley				0.13	
Greenville †	91	25	59.4	0.05	
Guinda				0.00	
Healdsburg *[1]	92	44	61.9	0.30	
Hollister	93	38	60.2	0.06	
Humboldt L. H				0.55	
Hydesville	79	35	54.7	0.32	
Iowa Hill *[1]	85	49	64.5	0.15	
Jackson	82	36	61.6	0.03	
Jolon				0.00	
Keeler *[8]	100	51	77.5	T.	
Keene *[8]	89	48	65.6	0.00	
Kennedy Gold Mine	91	40	65.8	0.45	
Kernville				0.00	
King City *[8]	98	44	65.2	0.00	
Kingsburg *[8]	95	55	75.2	0.00	
Kono Tayee	88	43	67.6	0.90	
Lagrange *[5]	99	47	72.6	T.	
Laporte *†[1]	80	36	55.1	0.71	
Las Fuentes Ranch				0.00	
Lemoore *a* *[8]	98	53	72.7	0.00	
Lick Observatory	75	33	58.0	0.28	
Lime Kiln	100	45	73.2		
Lime Point L. H				0.65	
Lodi	93	41	65.7	0.10	
Los Alamos †				0.00	
Los Gatos *b*	94	40	62.6	0.00	
Lytton Springs	94	48	65.8	0.15	
McMullin *[1]	102	48	74.7		
Malakoff Mine *[1]	86	44	65.4	0.20	
Mammoth Tank *[8]	110	65	88.7	0.00	
Manzana	93	40	65.7	0.01	
Mare Island L. H				0.28	
Marysville	94	48	69.3	0.36	
Merced *[8]	98	54	73.6	0.00	
Mills College				0.18	
Modesto *[8]	90	58	70.6	0.10	
Mohave *[8]	102	55	75.9	0.00	
Mokelumne Hill *[3]		50	65.4	0.27	
Monterey *[5]	74	44	58.2	0.08	
Mount Breckenridge				0.40	
Mount Frazier				0.28	0.8
Mount Glenwood *[1]	95	55	72.2	0.27	
Mutah Flat †				0.00	
Napa	98	44	65.0	0.25	
Needles	107	64	85.4	0.00	
Nevada City †	85	34	61.6	0.22	
Newcastle *a* †	91	42	65.7	0.15	
Newhall *[8]	92	40	65.3	0.08	
Nordhoff †	88			0.00	
North Ontario	85	46	62.6	0.07	
North San Juan *[1]	95	54	71.8	0.03	
Oakland *a*	92	47	61.0	0.29	
Ogilby *[8]	109	70	86.4	0.00	
Oleta *[1]	86	46	62.8	0.35	
Orangevale †	97	48	70.2	0.45	
Orland *[8]	110	56	76.9	0.00	
Oroville *b*	100	50	73.6	0.30	
Otay Dam *[1]	88	55	65.6	0.00	
Palermo †	99	45	71.8	0.20	
Paso Robles *b*	88	40	61.5	0.00	
Peachland *[1]	91	48	60.3	0.51	
Piedras Blancas L. H				0.35	
Pigeon Point L. H				0.10	
Pilot Creek				0.17	
Placerville	90	35	61.8	0.36	
Point Ano Nuevo L. H				0.05	
Point Arena L. H				0.10	
Point Bonita L. H				0.94	
Point Conception L. H				0.00	
Point Fermin L. H				0.00	
Point George L. H				0.08	
Point Hueneme L. H				0.04	
Point Lobos	81	45	55.0	0.71	
Point Loma L. H				0.00	
Point Montara L. H				0.05	
Point Pinos L. H				0.11	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
California—Cont'd.					
Point Reyes L. H.				0.20	
Point Sur L. H.				0.17	
Pomona (near)	90	42	65.9	T.	
Poway *[3]	84	55	59.6	0.12	
Quincy †	88	28	60.4	0.00	
Ravenna *[3]	98	52	69.2	0.11	
Redding *b*†	96	47	71.8	0.00	
Represa	90	42	67.4	0.35	
Riovista	91	46	67.5	T.	
Roe Island L. H.				0.00	
Rosewood	98	38	68.3	0.01	
Sacramento *a*	92	46	68.4	0.36	
Salinas *[8]	85	50	61.0	0.00	
Salton *[8]	112	74	94.0	0.00	
San Bernardino †	93	43	65.6	0.11	
San Jacinto	94	32	64.3	0.14	
San Jose *b*	90	35	61.4	0.16	
San Leandro *[1]	91	55	62.6	0.12	
San Luis L. H.				0.07	
San Mateo *[5]	91	53	65.6	0.00	
San Miguel *[8]	91	45	64.7	0.00	
San Miguel Island	74	46	58.1	0.03	
Santa Ana *[8]	78	56	67.6	0.13	
Santa Barbara *a*	74	46	59.5	0.00	
Santa Barbara L. H.				0.00	
Santa Clara *a*				0.05	
Santa Cruz *b*†	91	38	60.0	0.24	
Santa Cruz L. H.				0.13	
Santa Maria	85	42	64.6	0.01	
Santa Monica *[8]	77	57	67.1	0.00	
Santa Paula *b*†	85	39	59.0	0.00	
Santa Rosa *[8]	93	41	65.2	0.57	
Saticoy				0.10	
Shasta				0.01	
Sneddens Ranch *†[1]	78	18	48.0	0.00	
S. E. Farallone L. H.				0.03	
Stanford University	92	41	60.4	0.00	
Stockton *a*	94	45	66.0	0.09	
Summerdale †	80	36	57.9	0.28	
Susanville †	89	34	65.3	0.90	
Sutter Creek *[5]	85	36	61.0	0.75	
Tecarte Dam *[4]	96	39	57.4	0.00	
Tehama *[8]	96	51	74.8	0.08	
Templeton *[8]	88	48	62.4	0.00	
Trinidad L. H.				0.66	
Truckee *[8]	82	30	56.3	T.	
Tulare *b*				0.00	
Tulare *c*	100	40	73.2	0.00	
Turlock *b*†	100	40	68.7	0.00	
Ukiah †	91	36	62.9	0.09	
Upper Lake	92	39	65.6	0.22	
Upper Mattole *[1]	95	35	59.9	0.53	
Vacaville *a**[1]	95	53	68.8	0.27	
Ventura †	79	37	57.2	0.04	
Volcano Springs *[8]	116	70	86.0	0.00	
Walnutcreek	97	44	66.4	0.00	
West Palmdale *[5]	97	40	68.9	0.32	
Westpoint †				0.64	
Wheatland †	98	46	69.4	0.26	
Williams *[6]	95	44	73.8	0.20	
Wilmington *[5]	79	51	67.3	T.	
Wire Bridge *[5]	95	50	71.2	0.17	
Yerba Buena L. H.				0.40	
Yreka †	95	30	62.2	0.58	
Yuba City *[5]	93	50	69.8	0.42	
Engineers Quarters ‡				0.15	
Morses House ‡				0.18	
Deep Creek ‡				0.19	
Holcomb Creek ‡				0.11	
Colorado.					
Alma †	64	21	41.4	1.79	7.0
Antlers †	87	35	60.6	1.50	
Arkins				3.61	
Boulder	78	42	60.2	2.30	
Boxelder				3.49	
Breckenridge †	71	15	44.8	1.54	6.0
Canyon †	91	39	62.7	1.12	
Cheyenne Wells	92	37	61.8	1.44	
Collbran				1.10	
Colorado Springs †	80	36	55.8	1.27	
Crook	91	33	61.8	3.52	
Delta	92	34	62.8	0.65	
Downing †	88	38	60.8	1.65	
Dumont †	75	33	51.0	3.75	
Durango	77	36	56.8	3.22	
Fleming				3.30	
Fort Collins †	82	33	58.0	2.06	
Fort Morgan	88	36	61.6	1.47	
Garnett	78	25	51.8	1.14	
Gleneyrie †	79	35	54.8	2.20	
Gold Hill *[1] [e]	77	43	53.4		
Grand Junction †	89	39	65.3	0.62	
Greeley †	88	34	60.2	3.20	
Gulch †				2.00	
Holly				1.50	
Holyoke *a*				2.44	
Colorado—Cont'd.					
Holyoke (near)				1.94	
Hugo (near)	85	32	57.6	0.70	
Husted †	86	32	55.9	1.23	
Lake Moraine †	66	25	43.0	3.10	
Lamar †	96	40	66.6	1.00	
Laporte				3.35	
Las Animas †	93	41	64.3	0.80	
Lay †	85	21	56.1	0.75	
Leadville (near) *†[1]	65	31	43.4	1.34	
Leroy †	88	34	60.4	3.08	
Longmont †	90	38	63.2	2.59	
Longs Peak	68	23	45.0	1.60	4.0
Loveland				1.21	
Meeker †	88	25	56.8	1.64	
Millbrook †	74	27	51.4	2.05	
Minneapolis †	92	37	64.2	0.89	
Montrose †	84	34	59.2	1.50	
Moraine †	71	24	48.8	2.30	
Pagoda †	82	22	54.8	1.85	
Paonia †				0.62	
Parachute †	86	34	61.2	0.66	
Pinkhamton *[1]	82	29	55.2	2.06	
Rangely †	86	33	60.4	0.09	
Redcliff				0.76	
Rico †	73	25	48.4	4.15	
Ruby				3.65	6.0
Saguache †	76	32	54.7	1.53	
St. Cloud				2.47	
San Luis †	80	26	53.0	2.20	
Santa Clara *[1]	78	38	51.5	5.37	
Seibert †				0.91	
Sherwood Ranch	70	27	47.2		
Stamford *[1]	66	30	41.4	3.05	13.0
Steamboat Springs				1.50	
Sulphur Springs †	81	25	52.3	1.48	
Surface Creek †	87	29	58.6	1.23	
Thon †	90	36	59.0	2.10	
T. S. Ranch †	82	39	60.2	0.55	
Vilas				1.14	
Walden [g]	78	20	49.2		
Wallet †				0.25	
Wray †	89	37	63.7	3.34	
Yuma				1.62	
Connecticut.					
Bridgeport	82	40	58.7	6.62	
Canton †	81	31	55.6	4.96	
Colchester	81	37	57.8	5.01	
Hartford *b*				5.85	
Middletown	84	34	59.4	5.00	
New London †	74	39	55.4	4.76	
Norwalk	82	38	58.3	7.34	
Southington *[1]	83	34	58.0	5.50	
Storrs	81	36	56.0	4.44	
Voluntown †	81	37	57.7	4.46	
Waterbury	81	37	59.0	5.34	
West Cornwall †	77	35	54.3	4.22	
Windsor	83	36	59.4	5.47	
Delaware.					
Milford	85	41	63.9	3.04	
Millsboro	84	41	62.5	3.10	
Newark	81	40	60.6	6.17	
Seaford †	82	42	61.8	3.72	
District of Columbia.					
Distributing Reservoir *[5]	80	48	63.8	6.82	
Receiving Reservoir *[5]	80	44	63.2	6.33	
West Washington	85	37	62.1	7.02	
Florida.					
Amelia †	86	55	72.0	0.89	
Archer †	94	50	72.7	0.53	
Bartow	93	51	74.7	1.80	
Boca Raton †	87	59	75.8	11.00	
Brooksville †	93	59	75.6	0.90	
Clermont †	96	56	76.7	0.85	
De Funiak Springs	92	43	71.2	1.25	
Earnestville †	96	52	76.4	3.10	
Emerson †	99	47	74.4	0.93	
Eustis †	95	56	75.0	1.84	
Federal Point †	91	51	71.4	1.39	
Fort Meade †[1]	92	47	73.1	5.50	
Frostproof †	96	49	75.4	2.07	
Gainesville	96	52	75.4	2.18	
Grasmere †	97	52	75.2	3.30	
Huntington	95	57	74.7	2.38	
Kissimmee				4.26	
Lake Butler †	90	54	72.7	2.81	
Lake City †	99	53	77.4	0.66	
Lemon City †	90			7.20	
Macclenny †	98	51	73.9	1.20	
Manatee †				1.15	
Milton *[1]	88	46	70.6	1.13	
Mullet Key †	88	66	76.2	0.27	
Myers †	92	52	75.6	2.50	
New Smyrna [e]	90	48	72.2	3.84	
Oakhill *[1]	90	62	76.1		
Ocala *†[1]	91	63	74.5	0.82	
Orange City	95	55	75.6	2.40	
Florida—Cont'd.					
Orange Park	92	51	72.6	1.55	
Orlando †	91	55	72.8	1.25	
Oxford *†[1]	94	61	75.4	0.50	
Plant City †	95	50	75.0	2.63	
Quincy	91[e]	64[e]	78.8[e]	2.98	
St. Francis †	94	50	71.1	1.65	
St. Francis Barracks	87	50	72.1	1.43	
Tallahassee †	92	47	72.4	0.43	
Tarpon Springs †	86	54	72.6	0.32	
Georgia.					
Adairsville †	91	38	66.8	0.73	
Alapaha	96	46	71.8	1.15	
Albany †	96	43	71.6	1.49	
Allentown †	95	45	71.4	2.82	
Americus †	97	44	72.4	1.06	
Athens † [g]	93	45	70.8	0.61	
Bainbridge †	95	41	72.3	1.87	
Belleville	98[e]	50[e]	72.8[e]	4.20	
Blakely †	92	47	73.0	1.81	
Camak †	92	42	70.2	2.10	
Canton †				0.70	
Cartersville	87[d]	40[d]	64.8[d]	0.27	
Cedartown	90	42	66.2	0.75	
Clayton †	87	38	65.4	1.46	
Columbus	96	44	70.8	0.31	
Cordele	95	43	70.7	2.15	
Covington	85	41	63.8	0.95	
Dahlonega †	86	39	64.4	0.90	
Diamond	90	36	63.2	1.67	
Eastman †	94	45	71.0	3.53	
Elberton †	91	42	69.8	1.01	
Fleming †	95	45	70.6	0.57	
Fort Gaines	94	46	71.2	2.33	
Franklin	89	42	67.7	0.49	
Gainesville	90	40	66.9	1.15	
Gillsville †	91	42	63.6	0.00	
Greenbush	88	34	64.4	4.22	
Griffin †				0.97	
Hawkinsville	92	36	67.8	0.05	
Hephzibah *†[6]	88	54	72.4	0.90	
Jesup	95	49	72.4	1.66	
Lagrange †	92	45	69.8	1.16	
Leverett	97	43	69.8	1.55	
Louisville †	95	43	70.6	1.39	
Lumpkin	94	46	72.0	9.64	
Macon † *b*	94	41	71.5	0.87	
Marietta	87	39	66.0	0.41	
Marshallville †	90	47	71.6	0.96	
Milledgeville †	92	41	71.1	1.87	
Millen	96	48	71.7	4.61	
Monticello *†[1]	89	54	71.9	0.40	
Morgan †	94	43	70.2	1.25	
Newnan †	95	42	69.5	0.66	
Piscola	95	49	74.2	0.95	
Point Peter	92	42	66.8	0.96	
Poulan †	94	44	70.3	1.36	
Quitman †	97	47	72.3	2.07	
Ramsey	87	34	65.0	2.33	
Rome †	89	39	67.2	0.91	
Sparta	93	43	70.0	0.92	
Talbotton †	90	43	68.3	2.17	
Tallapoosa	91	39	66.8	0.50	
Thomasville †	94	47	72.2	2.57	
Toccoa †	92	43	68.4	0.85	
Union Point	91	43	69.6	2.03	
Washington †	95	42	70.6	3.73	
Waycross	94	49	71.9	3.39	
Waynesboro	92	45	70.7	3.94	
Westpoint	92	44	75.2	1.06	
Idaho.					
American Falls	91	30	61.4	0.60	
Blackfoot †	95	32	59.7	0.23	
Boise Barracks †	100	30	63.4	0.60	
Burnside †	85	21	57.9	0.78	
Cœur d'Alene	93	33	60.2		
Corral *†[1]	82	36	58.0	0.53	
Downey	87	20	58.2	0.60	
Fort Sherman †	95	33	60.9	0.78	
Gimlet †	87	25	58.6	0.52	
Idaho City	86[d]	24[d]	60.2[d]	1.43	
Kootenai †	94	37	63.8	1.26	
Lake †	78	20	49.0	0.26	
Lewiston *a*†[e]	100	37	68.5	2.94	
Lost River †				0.42	
Martin †	83	20	53.5		
Marysville	89	19	55.1	0.70	
Moscow	92[f]	32[f]	59.6[f]	1.20	
Murray †	91	27	57.3	1.19	
Nampa	98	28	63.7	0.49	
Oakley	96	23	61.2	0.90	
Ola †	92	27	61.8	1.10	
Paris	87	23	55.5	0.47	
Payette †	99	34	66.1	1.05	
Pollock †	98	35	65.0	1.38	
Rexburg	88	22	58.2	0.27	
Roseberry †	80	28	53.2	1.28	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Idaho—Cont'd.					
St. Maries	92	33	59.4	1.44	
Salubria	95	31	64.1	1.40	
Soldier†	87	29	55.8	0.47	T.
Swan Valley†	86	18	54.2	1.02	
Warren†	90	28	52.6	2.94	
Illinois.					
Albion†	87	37	61.5	2.61	
Alexander†	86	30	61.0	3.39	
Ashton*†[1]	87	38	59.8	1.58	
Atwood *a**†[2]	90	32	54.6	3.56	T.
Atwood *b*	.....	.....	.....	3.77	
Aurora *a*	92	31	59.6	1.06	
Aurora *b*	86	30	56.4	1.27	
Beardstown†	.....	.....	.....	2.38	
Bloomington†	88	31	60.1	1.90	
Bushnell†	89	33	60.2	1.11	
Cambridge	83	35	58.9	1.48	
Carlinville†	85	34	61.1	2.66	
Carlyle	.....	.....	.....	2.77	
Carrollton	81	35	59.4	2.09	
Charleston	82	34	58.4	2.93	
Chemung	82	30	54.2	1.67	
Chester	.....	.....	.....	3.16	
Cisne†	87	35	60.6	2.18	
Clearcreek†	89	30	58.0	0.95	
Coatsburg†	87	32	61.4	1.75	
Cobden†	85	37	62.2	2.00	
Danville	88	35	59.2	2.14	
Decatur†	86	32	59.0	3.21	
Dixon†	85	33	58.2	0.96	
Duquoin*[1]	88	41	63.1	2.45	
Dwight†	87	28	58.5	1.81	
East Peoria†	88	28	57.8	1.45	
Effingham†	84	32	59.4	2.63	
Evanston*[10]	82	36	54.2	.....	
Fort Sheridan†	83	32	54.8	1.32	
Friendgrove*†[5]	.....	38	60.2	2.94	
Galva†	85	33	59.2	1.06	
Glenwood*†[1]	86[d]	36[b]	56.0[d]	1.32	
Golconda†	88	35	64.4	1.70	
Grafton†	.....	.....	.....	1.17	
Greenville†	88	33	62.2	0.91	
Griggsville†	88	35	62.2	2.91	
Halliday*[5]	87[c]	47[c]	68.1[c]	2.68	
Havana†	84	40	61.8	1.08	
Herrin*[1]	84	40	63.4	2.58	
Hillsboro†	85	35	60.8	1.59	
Iron†	86	34	61.4	3.26	
Joliet†	88	32	58.6	1.25	
Jordans Grove†	86	36	61.3	1.57	
Kankakee *a*†	.....	.....	.....	1.51	
Kishwaukee	84	31	56.9	0.91	
Knoxville *a*	.....	.....	.....	1.20	
Lagrange†	83	32	55.4	1.85	
Laharpe*[1]	86	34	59.9	2.41	
Lanark*†[1]	83	28	54.8	1.24	
Lexington	88	34	60.8	1.68	
Loami†	.....	.....	.....	3.27	
Louisville†	83	36	59.7	2.31	
McLeansboro†	86	35	61.4	2.53	
Martinsville†	85	35	58.8	3.47	
Martinton†	88	32	58.0	1.78	
Mascoutah*[5]	90	38	61.6	2.27	
Mattoon*[1]	78	34	59.5	1.98	
Minonk†	88	31	58.5	1.05	
Monmouth†	85	32	59.4	0.94	
Morrisonville†	83	33	58.9	4.09	
Mount Carmel†	.....	.....	.....	3.14	
Mount Pulaski	83	32	59.6	1.47	
Mount Vernon	86	34	60.8	1.30	
New Burnside†	88	37	62.8	1.10	
Olney *a**[1]	90	36	63.2	2.75	
Oregon†	83	31	57.2	1.58	
Oswego*[1]	86	30	55.8	1.19	
Ottawa†	87	29	57.8	0.99	
Palestine†	87	37	59.0	3.45	T.
Paris	88	35	57.9	2.04	
Peoria *a*†	.....	.....	.....	1.75	
Peoria *b*†	87	35	60.0	1.29	
Philo†	85	32	56.8	1.97	
Plumhill†	88	36	62.4	1.53	
Rantoul†	86	31	57.8	2.23	T.
Reynolds	83	34	59.0	1.86	
Riley†	83	31	55.8	1.08	
Robinson*†[5]	88	40	58.6	3.67	
Rockford†	85	32	58.0	1.12	
Rose Hill†	.....	.....	.....	4.10	
Roundgrove†	88	29	59.7	1.95	
St. Charles*†[1]	85	34	57.0	1.41	
St. John*†[1]	87	44	63.2	2.45	
Scales Mound	85	27	56.6	1.52	T.
Streator†	85	35	58.4	1.13	
Sycamore†	81	31	56.2	1.10	
Tiskilwa*†[2]	86	34	57.5	1.42	
Tuscola†	85	32	57.8	2.78	
Warsaw†	.....	.....	.....	0.58	
Illinois—Cont'd.					
Walnut†	.....	32	.....	1.25	
Wheaton*[3]	.....	32	56.2	1.02	
Winnebago†	82	32	56.9	1.31	
Zion†	80	31	56.4	2.21	
Indiana.					
Anderson†	85	33	57.1	3.25	0.5
Angola*[1]	82	35	56.4	3.32	
Auburn	83	33	55.8	3.93	
Bloomington†	86	38	59.4	2.37	
Bluffton†	89	32	57.4	5.94	
Bright†	82	33	58.4	2.31	2.0
Butlerville†	87	34	58.1	3.08	2.2
Cambridge City†	83	33	55.6	4.10	0.1
Columbia City*[1]	80	34	56.8	3.51	
Columbus†	86	33	56.0	1.39	
Connersville†	83	32	56.1	2.98	T.
Delphi†	87	34	57.0	3.09	T.
Edwardsville*†[1]	86	41	61.8	3.37	
Evansville†	90	41	61.6	2.89	
Farmland†	82	33	56.0	3.21	4.0
Fort Wayne	84	34	57.0	3.28	
Greencastle†	84	34	57.4	2.72	0.5
Greensburg	84	33	63.0	3.33	
Hammond†	82	32	54.5	2.40	
Huntington	84	34	57.0	3.42	T.
Jasper†	89	39	60.2	3.50	
Jeffersonville	86	39	60.8	3.88	
Knightstown†	84	34	57.4	4.12	1.0
Knox	88	34	59.0	2.29	
Kokomo†	88	33	58.7	2.99	T.
Lafayette†	86	34	56.4	3.40	T.
Laporte	87	23	52.9	3.34	
Logansport *b*†	86	34	57.5	2.22	
Madison†	86	40	59.9	2.87	
Marengo†	90	38	60.6	2.59	T.
Marion†	85	33	56.9	4.38	2.0
Mauzy†	84	32	57.1	3.36	2.5
Mount Vernon†	87	38	62.1	2.47	
Northfield†	83	33	56.0	3.41	T.
Princeton*[1]	90	39	59.9	2.75	
Richmond	84	33	56.4	3.61	
Rockville†	86	34	57.2	1.94	
Rushville†	.....	.....	.....	3.35	0.5
Salem	89	32	57.6	2.49	
Scottsburg	88	37	59.8	2.60	T.
Seymour†	86	34	58.7	1.40	
Shelbyville	87	34	59.0	3.50	2.5
South Bend†	83	33	55.6	3.09	
Syracuse†	.....	.....	.....	3.56	T.
Terre Haute†	87	34	59.6	2.85	
Tipton†	88	32	58.8	3.93	
Topeka†	79	32	55.5	3.04	
Valparaiso†	88	30	57.0	5.15	0.3
Vevay	88	34	62.1	4.30	T.
Vincennes†	85	38	61.4	2.31	
Warsaw†	84	32	58.3	3.37	
Washington†	91	38	60.5	3.06	
Winamac	.....	.....	.....	4.08	T.
Worthington†	86	36	59.0	2.23	0.3
Indian Territory.					
Afton	90	43	65.6	0.42	
Healdton†	88	45	67.4	8.41	
Kemp†	91	44	70.4	7.98	
Lehigh†	89	42	68.0	3.94	
Purcell	90	43	67.8	6.13	
South McAlester	93	42	69.4	2.70	
Tahlequah	89[c]	40[c]	64.7[c]	4.59	
Tulsa†	.....	.....	.....	0.80	
Wagoner	94	45	70.0	0.26	
Iowa.					
Adair	.....	.....	.....	2.97	
Afton	91	33	61.8	2.19	
Algona*[1]	86	38	58.3	0.56	
Alta *a*†	84	32	57.8	0.98	
Amana†	85	33	58.5	3.56	
Ames *b*	91	34	58.8	2.58	
Ames (near)	.....	.....	.....	2.05	
Atlantic†	86	28	57.8	2.68	
Atlantic (near)	84	33	59.5	3.07	
Audubon	84	30	55.8	1.32	
Belknap	83	34	59.0	0.45	
Belleplaine	85	29	56.2	3.42	
Bonaparte†	89	32	60.5	0.60	
Britt	86	27	55.4	0.98	
Carroll	85	30	57.3	2.79	
Cedarfalls	87	30	58.6	2.64	
Cedar Rapids†	86	34	58.0	2.10	
Centerville	85	33	60.5	0.60	
Chariton	82	35	59.6	1.30	
Clarinda†	86	30	61.6	2.01	
Clinton	87	33	59.9	0.98	
College Springs	90	35	61.6	3.07	
Corning†	86	34	58.6	2.18	
Council Bluffs	88	37	62.2	2.02	
Cresco†	85	28	55.8	0.69	
Decorah†	86	28	56.2	0.79	
Iowa—Cont'd.					
Delaware*[3]	85	31	57.2	2.12	
Denison†	85	34	57.3	1.78	
Dows	84	26	55.0	3.24	
Eldora	90	28	58.1	3.37	
Elkader†	88	28	56.8	2.39	
Estherville[b]	89	30	55.4	1.29	
Fairfield†	84	30	58.6	0.58	
Fayette†	85	27	55.7	2.74	
Fonda	95	30	60.0	0.70	
Forest City	82	31	56.0	1.68	
Fort Madison*†[1]	96	42	64.3	1.94	
Fredericksburg	.....	.....	.....	2.26	
Galva†[b]	84	26	55.3	0.52	
Gardengrove	85	29	58.6	1.71	
Gladbrook	.....	.....	.....	1.90	
Glenwood†	87	30	58.0	3.26	
Grand Meadow*[1]	82	32	55.9	2.07	
Greene	89	28	57.3	2.07	
Greenfield†	87	33	59.4	2.09	
Grinnell†	81	33	58.6	1.53	
Grundy Center	86	29	56.7	3.30	
Guthrie Center	87	32	58.6	3.00	
Hampton	85	31	57.2	2.45	
Hawkeye	.....	.....	.....	2.29	
Hopeville†	83	35	59.2	3.13	
Humboldt†	88	28	58.0	1.49	
Independence†	83	28	55.3	2.10	
Indianola†	84	33	59.0	3.59	
Iowa City *a*†	85	34	58.4	3.11	
Iowa City *b*	83	34	57.6	.....	
Iowa Falls†	88	28	57.2	2.45	
Keosauqua	87	34	60.3	1.14	
Knoxville	85	36	60.5	1.68	
Lansing	88	30	57.9	0.94	
Larchwood	.....	.....	.....	0.21	
Larrabee†	88	28	56.4	0.98	
Leclaire	.....	.....	.....	1.59	
Lemars	84	28	57.2	1.10	
Lenox*[1]	84	42	60.7	1.69	
Logan†	84	35	60.4	1.80	
Malvern*[1]	92	31	58.1	2.47	
Maple Valley	.....	.....	.....	0.91	
Maquoketa	84	38	59.7	1.40	
Marshall†	86	32	58.4	2.23	
Millman	.....	.....	.....	2.83	
Mooar	85	32	57.8	0.94	
Mountayr†	87	34	60.8	2.60	
Mount Pleasant*[1]	82	38	61.8	1.80	
Mount Vernon *a**[1]	86	34	59.6	1.88	
Mount Vernon *b*	86	32	58.6	2.05	
Neola	89	32	59.6	1.55	
New Hampton	85	20	59.1	2.99	
Newton†	85	32	59.1	2.98	
North McGregor	.....	.....	.....	1.50	
Northwood	85	29	55.2	1.53	
Odebolt	.....	.....	.....	0.96	
Ogden	84	33	59.3	1.75	
Osage*†[3]	.....	38	54.6	.....	
Osceola	83	23	59.4	3.40	
Oskaloosa†	86	32	59.4	0.80	
Ottumwa[1]	84	38	60.8	0.63	
Ovid†	84	32	59.2	1.77	
Plover	86	28	57.7	0.47	
Primghar	85	29	58.2	1.07	
Red Oak	88	31	61.5	1.99	
Rockwell City	87	35	60.4	3.40	
Sac City†	83	32	56.8	1.90	
St. Charles	87	35	60.1	2.52	
Seymour†	86	32	60.6	1.15	
Sibley	87	29	56.0	0.73	
Sidney	84	37	61.2	2.63	
Sigourney	87	34	60.0	1.94	
Spencer	86	28	56.8	0.62	
Spirit Lake†	88	32	57.7	0.96	
Stuart	84	32	58.8	2.26	
Toledo	84	29	57.6	2.57	
Villisca†	85	34	59.7	1.83	
Vinton*[1]	83	31	58.0	1.87	
Washington	85	30	58.7	0.93	
Waterloo	86	30	57.2	2.03	
Washta	.....	.....	.....	1.34	
Waverly	85	31	56.9	2.87	
Webster City	82	33	57.4	2.82	
Westbend*†[1]	83	36	56.3	0.71	
Whitten*[1]	86	39	57.4	2.50	
Wilton Junction†	84	31	58.8	2.43	
Winterset†	85	35	58.6	1.82	
Kansas.					
Abilene†	94	33	64.2	2.47	
Achilles*[3]	91	40	58.2	0.55	
Altoona*†[3]	89	45	64.4	1.01	
Anthony	.....	.....	.....	2.99	
Assaria*[5]	94	33	64.4	0.62	
Atchison†	90	38	64.0	3.06	
Augusta	89	37	64.3	2.79	
Baker	90	40	63.8	3.51	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Kansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Beloit†	91	32	65.2	0.76	
Burlington†	90	36	65.5	0.60	
Campbell	96	34	63.1	2.93	
Colby†	90	31	61.4	1.73	
Columbus†	88	36	64.2	2.60	
Coolidge†	96	37	65.3	1.80	
Cunningham†	96	35	64.8	2.04	
Delphos*[1]	89	37	64.0	1.75	
Downs	.....	.....	.....	1.95	
Dresden*[1]	90	40	59.9	0.69	
Elgin*[1]	89	45	65.8	2.26	
Ellinwood†	89	37	63.4	2.71	
Emporia†	85	36	65.0	1.50	
Englewood†	91	40	66.0	3.26	
Eureka†	.....	.....	.....	1.49	
Eureka Ranch†	90	32	63.6	1.15	
Fall River	90	39	64.8	3.20	
Fort Riley†	90	37	64.3	3.09	
Fort Scott†	87	39	64.0	2.85	
Frankfort	98	39	66.1	4.34	
Garden City†	92	38	67.0	0.61	
Garfield	.....	.....	.....	0.85	
Gibson*[5]	84	31	60.6	3.04	
Goodland	96	35	64.3	1.01	
Gove*†[1]	92	46	62.7	3.53	
Grainfield*[6]	82	38	61.5	1.50	
Grenola	88	37	64.5	1.56	
Halstead	84	36	61.0	3.09	
Hays†	80	38	58.8	1.65	
Horton	89	37	63.4	2.90	
Hutchinson†	88	39	64.8	2.98	
Independence†	94	40	66.7	1.23	
Lakin†	96	33[b]	66.3[b]	0.01	
Lawrence	88	38	63.3	2.26	
Lebo†	90	36	64.4	2.25	
Linn	.....	.....	.....	2.72	
Macksville	86	35	62.6	3.17	
McPherson	90	34	62.8	2.92	
Manhattan *b*	94	37	65.1	2.30	
Manhattan *c*	92	33	63.4	2.43	
Marion†	92	34	65.8	3.50	
Meade†	92	43	68.0	3.77	
Medicine Lodge†	94	37	66.4	2.53	
Minneapolis†	93	30	63.0	2.84	
Morantown†	87	35	63.8	2.27	
Morton†	90	41	66.2	1.67	
Mounthope*[1]	87	50	64.2	3.18	
Ness City	.....	34	.....	1.45	
Newton	86	37	63.2	5.02	
Norton	90	31	61.2	0.53	
Norwich†	91[d]	40[e]	63.7[d]	2.75	
Oberlin†	.....	.....	.....	0.28	
Olathe†	90	36	64.1	1.75	
Osage City†	91	37	64.0	2.71	
Oswego	91	39	66.8	1.24	
Ottawa	90	35	62.8	3.24	
Phillipsburg	92	30	61.4	0.18	
Pleasant Dale	90	34	62.8	3.20	
Pratt	92	31	65.2	3.90	
Rome*†[1]	87	39	63.6	1.81	
Russell	89	33	64.2	0.49	
Salina†	92	30	63.9	1.54	
Sedan†	87	39	64.7	1.84	
Seneca	91	35	62.1	2.98	
Toronto	90	35	64.0	1.23	
Ulysses†	91[f]	42[f]	65.2[f]	1.73	
Wallace*[1]	94	38	65.9	0.49	
Wamego*[1]	92	42	63.9	2.00	
Wellington*[1]	86	38	65.5	0.65	
Yates Center	90	33	64.0	1.31	
Kentucky.					
Alpha†	90	40	62.8	2.35	
Ashland	88	35	61.0	4.20	T.
Bardstown†	90	37	60.4	3.47	
Blandville†	84	36	63.2	1.97	
Bowling Green *a**[1]	86	38	60.2	2.75	
Bowling Green *b*†	87	41	62.9	2.43	
Burnside†	.....	.....	.....	3.18	
Caddo†	84	32	60.4	4.47	2.0
Canton*†[1]	87	45	64.1	2.83	
Carlisle	89	34	59.7	5.00	T.
Carrollton†	88	27	63.7	3.10	T.
Catlettsburg†	.....	.....	.....	4.97	0.7
Earlington	88	39	63.4	1.78	
Edmonton†	84	40	61.2	1.88	
Ensor	86	41	62.0	2.03	
Eubank†	88	35	60.0	3.89	
Falmouth†	.....	.....	.....	5.51	T.
Fords Ferry†	89	36	63.2	1.75	
Frankfort†	89	37	61.0	3.71	
Franklin†	83	39	62.4	1.30	
Georgetown	84	37	60.7	.....	
Greensburg†	92	37	62.5	5.04	
Henderson†	91	40	63.6	2.03	
Hopkinsville†	89	37	62.9	2.58	
Leitchfield†	90	36	59.8	3.10	
Kentucky—Cont'd.	°	°	°	*Ins.*	*Ins.*
Louisa *a*	.....	.....	.....	3.36	0.5
Lyndon	86[d]	36[d]	59.3[d]	3.62	
Marrowbone†	87	36	61.0	2.47	
Maysville	88	35	59.8	5.99	
Middlesboro†	87	37	59.8	6.04	
Mount Sterling†	84	36	59.6	4.73	T.
Owensboro†	87	41	60.2	2.19	
Owenton†	89	33	60.8	4.38	
Paducah *a*†	.....	.....	.....	2.60	
Paducah *b*†	90	40	65.8	2.53	
Pilot Oak	.....	.....	.....	1.22	
Pleasure Ridge Park†	90	38	59.6	3.58	
Richmond†	88	34	60.5	3.42	T.
Russellville†	89	37	63.4	1.59	
St. John†	87	38	59.1	3.39	
Sandyhook	.....	.....	.....	4.37	0.1
Shelbyville†	91	37	60.8	4.45	
Southfork[g]	.....	.....	58.2	5.58	
Williamsburg†	87	40	63.5	4.40	
Louisiana.					
Abbeville	90	50	73.2	1.75	
Alexandria†	91	45	70.8	5.29	
Amite†	91	50	71.8	4.44	
Bastrop†	89	46	69.8	3.00	
Baton Rouge†	90	49	72.4	4.57	
Calhoun	91	51	70.8	2.70	
Cheneyville†	91	42	70.4	3.97	
Clinton†	92	44	72.2	1.27	
Covington	91	44	72.2	3.27	
Donaldsonville†	95	50	75.6	1.10	
Elm Hall	89	48	70.8	0.90	
Emilie†	89	50	71.8	2.00	
Farmerville	89	48	70.2	3.74	
Franklin†	92	52	73.9	4.23	
Grand Coteau	87	51	72.8	2.45	
Hammond	91	46	68.5	4.72	
Houma	89	46	72.6	0.15	
Jeanerette	92	46	73.7	2.46	
Lafayette†	92	48	73.4	2.93	
Lake Charles†	89	54	72.6	1.98	
Lake Providence	88	49	68.8	0.54	
Lawrence	89	53	72.5	2.75	
Liberty Hill	94	43	71.2	2.49	
Mansfield†	89	44	70.0	3.87	
Melville	92	55	73.6	3.90	
Minden	93	46	72.6	1.46	
Monroe†	91	51	72.0	1.73	
Montgomery	96[e]	45[e]	73.2[e]	0.72	
New Iberia	90	51	73.0	0.75	
Oakridge†	96	44	70.3	1.35	
Oberlin	91	47	71.4	1.40	
Opelousas†	91	45	68.8	3.25	
Oxford†	87	44	69.0	2.29	
Paincourtville†	93	47	73.6	0.82	
Plain Dealing†	88	48	70.4	2.36	
Rayne	93	46	73.1	2.91	
Robeline	91	42	69.4	0.88	
Ruston	89	51	71.4	2.04	
Schriever	93	44	72.4	3.32	
Shellbeach	90	62	75.6	4.08	
Southern University†	85	50	70.2	0.50	
Sugar Ex. Station†	88	51	73.0	1.11	
Sugartown†	89	49	72.6	1.97	
Thibodeaux	.....	.....	.....	3.07	
Venice†	88	55	72.7	0.65	
Wallace	89	50	73.2	0.61	
Whitehall	94	44	72.0	3.68	
White Sulphur Springs	93	48	72.2	2.87	
Maine.					
Bar Harbor	78	30	50.4	6.36	
Belfast*[6]	67	39	51.3	5.02	
Cornish*[1]	74	38	53.6	6.66	
Fairfield	75	29	53.6	4.47	
Flagstaff	74	22	50.1	7.33	
Fort Fairfield	75	27	51.2	3.80	
Gardiner	76	34	55.8	5.94	
Kineo†	80	30	49.0	3.96	
Lewiston	76	37	55.6	5.25	
Mayfield	75	27	51.0	5.04	T.
North Bridgton	76	32	54.8	5.47	T.
Orono	76	29	53.0	4.49	
Maryland.					
Annapolis	80	42	64.1	6.67	
Bachmans Valley	80	36	59.0	7.52	
Boettcherville[2]	.....	.....	57.6	4.60	
Charlotte Hall†	85	42	63.6	4.69	
Cherryfields†[2]	.....	.....	61.5	2.83	
Chestertown†	79	45	61.3	4.71	
Collegepark	81	39	60.1	7.45	
Cumberland *b*	84	45	62.9	3.47	
Darlington†	83	42	61.2	5.47	
Denton	82	41	59.0	2.97	
Easton†	83	43	61.9	3.32	
Ellicott City	76	48	62.2	6.73	
Fallston*[1]	81	44	60.2	5.92	
Flintstone	86	33	58.3	4.30	
Maryland—Cont'd.	°	°	°	*Ins.*	*Ins.*
Frederick	83	39	61.5	3.71	
Grantsville	78	30	53.1	3.86	
Greatfalls*[5]	83	46	63.1	5.42	
Greenspring Furnace	84	37	60.3	5.10	
Hagerstown†	84	42	62.0	4.30	
Jewell†	84	41	60.1	5.79	
Johns Hopkins Hospital	80	42	62.5	6.34	
Laurel	82	37	61.3	5.62	
McDonogh[g]	81	44	67.1	.....	
Mardela Springs†	82	41	62.5	3.79	
Mount St. Marys Coll.†	81	41	60.6	5.97	
New Market	83	40	61.4	5.31	
Pocomoke City	86	43	65.5	3.07	
Port Deposit	81	42	61.3	5.16	
Princess Anne	82	37	61.1	3.12	
Sharpsburg	83	39	60.1	5.25	
Smithsburg	80	39	60.6	5.52	
Solomons†	81	44	62.4	2.41	
Sunnyside	76	28	51.4	5.83	6.0
Taneytown†	85	40	61.5	7.34	
Van Bibber	81	41	61.6	5.36	
Western Port	86	34	59.0	3.80	
Westminster	84	41	61.6	6.63	
Woodstock	82	43	61.3	6.64	
Massachusetts.					
Amherst	81	32	57.0	4.24	
Bluehill (summit)	81	35	55.6	4.38	
Cambridge *a*	78	36	58.2	3.78	
Chestnut Hill	80	36	58.4	4.40	
Concord†	82	31	56.5	4.39	
Fallriver	76	36	57.2	4.10	
Fitchburg *b*	81	36	56.9	4.41	
Framingham	83	35	60.2	4.46	
Groton	82	31	56.4	4.78	
Hyannis*†[1]	72	45	58.9	2.89	
Lawrence	85	34	58.3	4.84	
Leeds	84	34	57.8	4.34	
Lowell *a*	78	34	58.1	4.94	
Middleboro	79	34	56.2	4.19	
Monson	84	30	58.2	5.15	
New Bedford *a*	74	38	55.3	6.07	
Pittsfield	75	33	55.8	3.66	
Springfield Armory	85	30	56.0	4.70	
Taunton *b*	81	37	56.8	5.10	
Wakefield	78	35	57.7	5.66	
Westboro†	85	28	59.2	4.04	
Worcester *b*	80	39	57.8	4.52	
Michigan.					
Adrian	79	34	55.4	3.41	
Allegan	82	30	54.0	3.00	
Alma	81	30	53.8	2.68	
Ann Arbor	81	34	55.0	4.74	
Arbela	80	31	54.4	5.68	
Badaxe†	81	31	52.8	4.97	
Baldwin	83	26	51.4	2.52	T.
Ball Mountain	76	33	53.0	4.77	
Baraga	85	25	46.8	2.54	T.
Battlecreek	82	33	55.5	2.85	
Bay City *b*	79	.....	.....	3.65	
Benton Harbor[k]	84	34	54.7	0.11	
Benzonia	82	29	53.0	2.60	T.
Berlin	81	30	52.7	4.34	
Berrien Springs	84	33	53.8	2.87	T.
Big Rapids	80	30	52.2	2.02	
Birmingham	81	30	55.9	4.78	
Bois Blanc*[10]	71	21	47.1	.....	
Boon	80	26	49.3	3.68	0.5
Calumet	78	29	47.7	3.67	2.0
Camden	80	32	54.0	3.10	
Carsonville	89[e]	32	53.9[e]	4.79	
Charlevoix	76	33	51.2	2.25	
Cheboygan	79	31	49.1	3.25	
Clinton	82	33	55.5	3.50	
Cold Water	80	33	54.9	5.30	
East Tawas	76	32	50.6	3.29	
Eloise	81	34	54.5	3.76	
Escanaba†	71	31	48.9	1.92	T.
Fairview	79	34	53.4	3.08	
Fitchburg	80	32	53.2	3.85	
Flint	81	32	52.5	3.65	
Gladwin	75	31	52.7	3.30	
Grand Rapids *b*	80	33	55.4	1.66	
Grape	82	34	55.9	2.83	
Grayling	81	28	49.8	2.63	T.
Hanover	80	33	54.4	4.28	
Harrison	77	30	50.4	2.38	
Harrisville	74	32	48.2	4.67	
Hart	84	30	52.1	1.81	T.
Hastings	78	31	55.2	2.58	
Hayes	87	31	52.8	4.09	
Hesperia	83	27	53.6	1.74	
Highland Station	.....	.....	.....	3.64	
Hillsdale	80	33	54.2	4.08	
Holland*[10]	78	33	53.4	.....	
Howell	80	32	54.0	2.20	
Humboldt	80	24	47.4	2.32	T.

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Ionia	82	30	55.2	1.92	
Iron River	80[e]	20[e]	44.7[e]	2.09	T.
Ivan	76	29	50.0	3.98	T.
Jackson	81	34	56.0	2.93	
Jeddo	81	32	52.1	4.43	
Kalamazoo	81	33	55.0	3.30	
Lake City	80	28	50.4	2.28	
Lapeer	82	29	54.0	5.06	
Lathrop	82	24	46.9	2.04	
Ludington	73	28	51.0	2.73	
Luzerne	85	27	49.9	3.33	
Mackinaw City	75	30	46.1	2.52	
Madison	81	34	56.4	3.10	
Mancelona	79	28	49.6	4.30	0.5
Manistee	80	28	49.6	2.79	T.
Manistique	67	23	45.7	2.51	T.
Mayville	78	32	51.7	5.06	
Middle Island *[10]	72	33	47.5	......	
Midland	78	31	53.0	2.12	
Mottville	83	30	55.3	4.28	
Mount Clemens	84	29	54.6	3.47	
Mount Pleasant *b*	80	31	53.7	1.65	
Muskegon	81	34	52.3	1.13	
Newberry	75	20	45.7	2.95	1.0
North Manitou Island *[10]	68	22	47.6	......	
North Marshall	79	30	53.0	3.21	
Northport	80	32	49.6	3.17	T.
Old Mission	77	30	49.6	3.84	
Olivet	78	34	54.4	3.30	
Ovid	79	32	53.6	3.40	
Owosso	81	33	54.4	3.32	
Parkville	......	......	......	3.74	
Petoskey	76	30	46.5	3.23	
Plymouth	81	31	54.6	4.19	T.
Point Aux Barques *[10]	80	36	52.1	......	
Pontiac	81[e]	30[e]	56.0[e]	3.17	
Port Austin	80	29	50.4	2.61	
Powers	83	27	50.0	2.21	
Reed City	81	27	51.4	2.29	
Rockland	84	22	49.1	2.70	
Rogers City	79	27	48.0	5.89	
Romeo	80	34	54.8	4.72	
Saginaw	81	31	54.6	4.03	
St. Ignace	70	28	46.4	2.67	
St. Johns	81	33	54.6	3.26	
Sandbeach *b*	80	30	50.4	3.74	
Saranac	82	30	54.9	1.99	
Sidnaw	82	24	47.1	1.81	T.
Somerset	78	33	54.2	3.05	
South Haven	83	33	52.2	1.59	
Stanton	80	30	53.5	1.94	
Sturgeon Point *[10]	62	35	48.3	......	
Thomaston	83	23	47.7	3.98	1.7
Thornville	83	34	55.5	5.15	
Three Rivers	......	......	......	5.17	
Thunder Bay Island *[10]	62	33	45.5	......	
Traverse City	88	31	51.8	3.48	
Valley Center	80	27	52.9	3.10	
Vandalia	81	32	55.8	4.37	
Wasepi	80	33	54.8	4.24	
Waverly	87	29	53.0	1.77	
West Harrisville	76	31	49.1	3.98	
Wetmore	80	24	45.8	3.15	4.0
White Cloud	81	28	53.8	2.14	
Ypsilanti	81	34	54.6	4.67	
Minnesota.					
Ada†	89	24	56.2	0.48	
Albert Lea [g]	86	33	58.2	1.60	
Alexandria†	88	28	54.6	0.59	
Belleplaine *[1]	87	34	54.0	1.10	
Bird Island	87	27	56.0	1.29	
Blooming Prairie†	86	27	55.0	0.95	
Bonniwell	94	30	56.1	0.65	
Caledonia†	86	29	56.6	1.31	
Camden	89	21	57.0	1.39	
Campbell	93	22	55.6	0.45	
Collegeville	87	33	56.6	1.48	
Crookston†	86	27	55.0	1.21	T.
Dawson [g]	......	......	......	1.65	T.
Detroit City	91	25	58.2	1.34	
Faribault	86	25	55.3	1.11	
Farmington†	90	26	53.8	0.85	
Fergus Falls†	86	29	55.5	1.52	T.
Glenwood†	92	28	55.4	1.22	
Grand Meadow†	87	25	54.5	1.55	
Granite Falls	88	29	56.4	2.10	
Lake City	91	30	57.1	1.83	
Lakeside†	87	29	55.1	1.30	
Lake Winnibigoshish [1]	86*	26	51.6	1.13	
Lambert†	84	22	53.6	0.67	T.
Leech Lake [1]	82*	23	51.4	0.98	
Lesueur *[1]	90	28	55.7	0.78	
Long Prairie†	89	24	54.0	1.56	
Luverne†	88	28	55.0	1.56	
Mapleplain	89	29	56.2	1.45	
Maplewood *[1]	86	41	57.8	......	
Minnesota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mazeppa [1]	92*	28	55.4	0.70	
Milaca	......	......	......	3.50	
Milan†	91	22	57.3	0.86	T.
Minneapolis *a*†	90	30	56.6	1.92	
Minneapolis *b* [1]	85*	25	54.9	1.62	
Minnesota City *†[1]	92	32	57.4	2.90	
Montevideo†	92	30	57.3	1.40	
Morris	93	30	57.0	0.90	
Mount Iron	83	23	49.4	......	
New London	85	28	53.8	1.75	
New Richland *[1][e]	86	34	56.4	......	
New Ulm†	87	33	57.0	0.76	
Park Rapids†	88	25	51.6	1.05	
Pine River [1]	85*	27	53.8	1.33	
Pleasant Mounds†	87	28	56.0	0.80	
Pokegama Falls [1]	86*	18	50.8	1.50	
Redwing	......	......	......	1.54	
Reeds	......	......	......	1.81	
Rolling Green	81	29	55.2	0.60	
Roseau [e]	86	27	52.4	1.36	
St. Charles†	89	25	56.4	1.71	
St. Cloud	78	30	53.8	1.96	
St. Olaf	88	31	55.6	0.77	
Sandy Lake Dam [1]	82*	25	51.4	1.89	
Shakopee [6]	84*	30	56.1	0.86	
Tower†	83	20	50.0	1.60	1.0
Two Harbors†	79	31	47.0	2.55	T.
Wabasha *[1]	92	36	56.8	2.24	
Willmar†	85	29	55.0	2.01	
Worthington	81	30	55.6	0.93	T.
Zumbrota [1]	86*	23	56.4	......	
Mississippi.					
Aberdeen†	96	38	67.4	3.40	
Agricultural College	92	47	70.2	1.26	
Austin†	92	45	68.8	0.37	
Batesville†	90	44	66.3	1.32	
Bay St. Louis	86	52	72.4	0.19	
Biloxi†	88	52	72.4	0.67	
Booneville†	91	40	67.8	1.16	
Briers†	88	54	69.7	0.82	
Brookhaven†	97	41	71.4	1.71	
Canton†	91	49	70.6	1.07	
Columbus *a*†	......	......	......	1.13	
Columbus *b*†	100	42	70.3	1.01	
Corinth†	91	41	67.0	2.60	
Crystal Springs†	97	46	71.0	1.32	
Edwards	92	47	72.1	0.74	
Enterprise	91	42	69.2	0.92	
Fayette†	92	44	70.8	3.97	
French Camps†	91	37	66.2	2.23	
Fulton†	94	40	68.0	3.31	
Greenville *a*	89	53	70.8	1.51	
Greenville *b*†	91	49	70.4	2.19	
Hattiesburg†	95	49	74.0	0.62	
Hazlehurst†	96	49	71.2	1.30	
Hernando†	91	40	67.8	1.30	
Holly Springs†	93	44	68.0	1.39	
Jackson†	93	42	69.2	1.92	
Lake†	90	45	68.0	1.32	
Leakesville†	91	42	71.0	2.84	
Logtown†	90	49	72.5	1.10	
Louisville†	92	41	68.1	0.99	
Macon†	92	40	68.2	1.80	
Magnolia†	92	42	71.6	4.63	
Mayersville	87	54	71.4	1.25	
Meridian†	91	42	68.9	1.34	
Mosspoint	92	50	72.7	......	
Natchez†	88	43	71.4	1.25	
Okolona†	96	44	69.1	3.06	
Pontotoc	92	43	68.0	2.01	
Port Gibson†	92	43	69.4	1.82	
Rosedale	90	57	71.9	......	
Stonington *[1]	88	52	72.3	......	
Thornton†	90	54	72.0	0.55	
Topton *[5]	90	54	75.0	0.85	
Water Valley *†[1]	90	46	65.7	4.05	
Waynesboro *b*†	89	44	69.3	2.40	
Windham†	94	38	69.4	4.19	
Woodville†	89	48	71.4	4.29	
Yazoo City†	94	52	72.4	0.43	
Missouri.					
Akron	..			1.76	
Appleton City	90	33	65.2	1.69	
Arlington†	......	......	......	3.49	
Arthur *†[2]		50	63.5	2.54	
Avalon	85[d]	36*	62.3[e]	3.68	
Bagnell†				3.50	
Birchtree	85	36	61.1	2.85	
Bolckow†				2.90	
Boonville†				2.77	
Brunswick	85	37	61.2	4.78	
Carrollton†	86	41	63.2	3.65	
Conception	82	39	61.4	2.95	
Cowgill *[5]	84	42	63.0[e]	2.36	
Darksville†	93	36	64.6	2.97	
Downing	......	......	......	1.03	
Missouri—Cont'd.	°	°	°	*Ins.*	*Ins.*
East Lynne *[3]	......	40	59.4	2.82	
Edgehill *[5]	86	44	64.6	2.56	
Eightmile *[1]	84	38	61.3	2.49	
Eldon *[1]	92[d]	43	62.3	1.59	
Elmira	90	36	61.8	3.60	
Emma *[3]	......	46	62.8	2.90	
Fairport	......	......	......	2.05	
Farmersville	......	......	......	2.32	
Fayette	87	39	64.2	2.85	
Fulton	......	......	......	2.49	
Gallatin *[1]	83	38	62.3	2.32	
Glasgow	85	37	62.2	3.14	
Gordonville *[3]	......	44	59.2	1.56	
Gorin	......	......	......	1.64	
Halfway	91	37	63.8	3.40	
Harrisonville†	88	36	62.3	3.27	
Hastain	87	37	63.8	3.90	
Hermann†	......	......	......	3.01	
Houston	88	38	62.2	2.09	
Houstonia	......	......	......	3.21	
Irena	......	......	......	3.57	
Ironton†	87	30	60.8	2.78	
Jefferson City†	90	42	63.9	2.90	
Kidder	85	35	61.0	2.23	
Lamar†	87	38	64.6	1.67	
Lamonte	......	......	......	5.20	
Lebanon	86	40	63.6	3.21	
Lexington†	88	39	63.4	2.33	
Liberty	89	38	62.8	2.58	
McCune *†[1]	85	41	60.8	3.04	
Mansfield	......	......	......	2.10	
Marblehill	87	30	60.6	1.47	
Marshall†	90	35	63.0	1.77	
Maryville	85	35	60.4	3.83	
Mexico†	86	36	62.4	3.99	
Mine La Motte†	83	34	59.8	4.28	
Mineralspring	86	37	62.3	2.84	
Montreal *[1]	84	44	61.4	1.73	
Mount Vernon	86	38	64.4	4.22	
Neosho	85	32	62.6	1.73	
Nevada *[1]	85	43	65.1	1.97	
New Haven *[1]	85	44	65.8	2.58	
New Madrid	80	40	61.6	1.89	
New Palestine *†[1]	84	44	65.6	3.65	
Oakfield	85	41	63.7	1.98	
Oakmound	......	......	......	1.60	
Oakridge *[4]	......	43	60.5	3.44	
Olden†	86	38	62.0	2.54	
Oregon *a*	85	39	63.1	3.44	
Oregon *b* *[1]	85	41	62.1	3.33	
Osceola†	......	......	......	3.35	
Palmyra *[5]	86	40	63.3	1.37	
Phillipsburg *†[1]	92	42	62.4	1.58	
Pickering *[3]	......	38	58.4	3.54	
Platte River *[3]	86	44	61.2	5.34	
Poplar Bluff	90[c]	39[b]	63.8[b]	3.02	
Potosi	81	28	55.2	1.89	
Princeton	88	35	60.6	2.30	
Rhineland	85	37	62.2	3.66	
Richmond	85	40	62.8	3.84	
Rolla	......	......	......	3.61	
St. Charles	83	38	61.2	1.76	
St. James *[3]	......	44	59.6	......	
St. Joseph†	......	......	......	4.16	
St. Louis	85	38	60.1	1.65	
Sarcoxie *[3]	......	36	61.0	3.70	
Sedalia	86	38	62.4	5.38	
Seymour *[1]	88	38	61.8	2.51	
Shelbina	......	......	......	1.50	
Sikeston	87	39	64.2	2.77	
Stellada†	88	36	62.9	2.12	
Sublett	86	33	60.0	0.70	
Taneyville	87	40	60.7	......	
Unionville†	89	33	63.6	1.27	
Vichy	86	35	63.0	4.20	
Virgil City	......	......	......	1.13	
Warrenton	87	36	61.8	2.18	
Wheatland	......	......	......	3.84	
Willow Springs	86	38	62.0	1.51	
Zeitonia *[1]	88	36	63.1	1.25	
Montana.					
Augusta†	93	28	62.5	0.86	
Bigtimber†	86	36	62.2	1.05	
Billings†	90	36	61.8	0.20	
Boulder	86	30	57.4	1.12	
Bozeman†	85[j]	29	57.6[e]	0.35	
Bozeman Exper. Stat'n.	81	30	58.3	0.78	
Butte†	82	30	56.6	1.44	T.
Castle	78	28	53.2	0.88	0.8
Chinook†	96	33	65.5	0.38	
Choteau†	90	27	59.8	1.05	
Columbia Falls	86	28	59.0	0.82	
Deer Lodge	86	......	......	0.70	T.
Ekalaka	88	30	59.3	1.25	
Fort Benton	92	36	64.0	1.14	
Fort Custer†	91	36	64.0	0.54	

Table II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Montana—Cont'd.					
Fort Keogh†	94	35	63.6	0.35	
Fort Logan†	84	30	56.2	1.22	
Fort Missoula	88	33	59.0	1.09	
Glasgow	94	28	60.3	0.18	
Glendive†	98	34	64.4	0.95	
Greatfalls†	94	34	61.5	0.95	
Harlem†	85	24	53.8	......	
Hogan†	90	34	57.4	1.10	
Kalispell	89	32	59.0	0.34	
Kipp†	93	21	57.1	1.00	
Lewistown	87	28	57.6	0.84	1.0
Livingston†	87	23	57.8	0.60	T.
Manhattan†	85	31	60.2	1.71	1.0
Martinsdale†	86	29	57.6	0.96	
Marysville†	81	32	57.0	1.12	T.
Monarch	83	27	55.8	0.66	
Poplar†	93	28	60.6	0.47	
Radersburg	......	......	......	1.50	
St. Ignatius Mission†	91	30	60.6	......	
St. Pauls†	85	20	51.2	1.10	
Troy	90	28	59.4	0.52	
Utica†	87	31	58.8	1.33	
Virginia City†	83	26	57.3	2.91	2.5
Wibaux†	......	......	......	0.85	
Yale†	86	31	56.9	0.90	
Nebraska.					
Agee*[1]	88	39	59.4	2.31	
Albion	95	29	62.4	2.69	
Alliance*[1]	84	37	59.0	2.52	
Ansley†	91	23	62.2	1.54	
Arapaho*[1]	89	34	62.6	2.50	
Arborville*[1]	90	26	58.7	3.02	
Arcadia	92	28	60.4	1.25	
Ashland *a*†	90	36	61.4	2.12	
Ashland *b**[1]	93	42	64.0	2.41	
Ashton	92	31	60.6	0.48	
Auburn*†[1]	90	37	62.2	5.26	
Aurora*[1]	88	42	62.1	2.09	
Bassett	92	25	60.1	1.13	
Beatrice†	88	34	60.6	2.41	
Beaver City†	91	31	62.6	0.85	
Benedict	......	......	......	3.35	
Benkelman	......	......	......	0.25	
Bluehill*[1]	89	38	63.0	2.40	
Brokenbow	......	......	......	0.37	
Burchard	......	......	......	2.50	
Burwell	......	......	......	0.60	
Callaway†	85	29	59.8	0.30	
Camp Clarke	......	......	......	0.85	
Central City	......	......	......	1.75	
Chester*[1]	85	38	60.0	1.93	
Columbus†	88	33	60.2	1.12	
Cornlea	......	......	......	2.69	
Creighton†	88	27	58.6	0.65	
Crete	86	35	60.4	1.69	
Culbertson	......	......	......	0.75	
Curtis *a*	91	34	64.2	0.43	
David City*†[1]	86	42	60.4	2.65	
Divide	......	......	......	0.61	
Dunning*[1]	88	27	62.5	0.34	
Eden	......	......	......	4.00	
Edgar*[1]	88	40	63.3	4.44	
Elba	......	......	......	0.56	
Ericson*†[1]	92	45	66.0	2.07	
Ewing†	......	......	......	0.30	
Fairbury†	89	28	61.8	3.65	
Fairmont†	89	34	60.2	2.06	
Fort Robinson	90	27	60.1	0.65	
Franklin	101	32	64.6	1.13	
Fremont†	88	34	59.6	0.86	
Geneva†	88	33	61.2	2.61	
Genoa	90	33	60.4	1.64	
Gering†	92	26	61.0	1.79	
Gothenburg	98	27	64.1	0.55	
Grand Island *a**[1]	95	38	64.4	1.68	
Grand Island *b*	88	31	60.3	1.59	
Greeley	......	......	......	1.90	
Haigler*[1]	94	40	64.6	1.62	
Hartington†	89	28	59.0	0.98	
Harvard*[1]	90	43	61.2	3.06	
Hastings*[1]	89	43	61.4	2.82	
Hayes Center	......	......	......	0.37	
Hay Springs	90	26	58.4	2.27	
Hebron†	88	33	60.9	3.27	
Hickman	......	......	......	2.36	
Holdrege *b**[1]	94	42	63.7	2.80	
Imperial *a*†	93	32	63.0	1.95	
Indianola (near)*[1]	88	38[d]	62.9[e]	0.74	
Kearney*[5]	88	40	63.5	1.18	
Kennedy	94	19	59.8	1.76	
Kimball†	89	32	59.4	3.86	
Kirkwood*[1]	92	41	60.7	1.50	
Lexington†	87	23	60.1	0.30	
Lincoln *b*†	88	37	62.1	2.94	
Lincoln *d*	92	35	61.8	2.43	
Lodgepole†	93	24	60.6	3.38	
Nebraska—Cont'd.					
Loup *a*	......	......	......	0.58	
Loup *b**[1]	88	28	59.5	0.65	
Lynch*†[1]	91	33	59.4	1.34	
Lyons	88	32	59.0	1.21	
McCook*[1]	88	46	65.8	0.11	
McCool	......	......	......	2.25	
Madison*[1]	85	28	56.8	1.25	
Madrid*[5]	90	35	61.6	0.88	
Marquette	......	......	......	2.48	
Minden *a**[1]	91	34	60.8	2.11	
Minden *b*	......	......	......	2.50	
Monroe	......	......	......	1.33	
Nebraska City *a*	85	36[c]	60.6	3.24	
Nebraska City *b**[1]	86	38	60.8	3.67	
Nemaha*[1]	95	41	62.8	2.92	
Nesbit	91	25	59.8	0.27	
Norfolk*†[5]	85	32	60.2	1.03	
Norman	90	30	61.4	1.96	
North Loup†	90	28	60.4	0.72	
Oakdale†	90	30	59.0	1.12	
Odell*[5]	90	46	65.1	2.43	
O'Neill†	84	28	57.9	1.35	
Ord	92	26	59.3	1.05	
Osceola	......	......	......	2.94	
Ough†	......	......	......	0.68	
Palmer *b*	......	......	......	2.30	
Plattsmouth *a*†	......	......	......	2.68	
Ravenna *a*	89	26	59.6	1.94	
Ravenna *b**[1]	88	32	60.4	1.47	
Redcloud *a*	......	......	......	1.63	
Redcloud *b**[1]	87	46	64.7	2.65	
Republican*[1]	88	38	64.6	1.40	
Rulo*[1]	88	48	65.0	4.30	
St. Libory	90	31	61.6	1.00	
St. Paul	88	32	62.6	0.50	
Salem*[1]	82	44	62.9	5.30	
Santee Agency†	89	31	61.5	0.86	
Sargent	......	......	......	0.81	
Schuyler	......	......	......	0.69	
Seneca*[1]	90	40	63.8	0.50	
Seward*[1]	90	45	60.4	5.23	
Springfield*[1]	88	38	60.8	2.81	
Springview	93	30	62.2	2.11	
Stanton*[1]	85	36	59.3	1.27	
Stockham	......	......	......	3.60	
Strang*[1]	90	44	65.8	3.39	
Stratton	......	......	......	0.45	
Stromsburg	......	......	......	2.57	
Superior*[5]	87	40	63.2	1.71	
Sutton	......	......	......	2.12	
Syracuse	......	......	......	2.45	
Tecumseh *b*†	92	31	59.3	7.09	
Tekamah	90	33	59.6	0.61	
Thedford*[1]	90	32	62.2	0.90	
Turlington†	87	34	60.6	4.01	
Valentine†	88	26	59.4	3.71	
Valparaiso	......	......	......	2.52	
Wakefield	86	31	58.4	1.51	
Wallace*[1]	90	50	63.2	T	
Wayne	......	......	......	2.76	
Weeping Water*[1]	88	34	58.2	0.45	
Westpoint†	87	32	59.6	1.47	
Whitman	......	......	......	1.13	
Wilber*[1]	88	43	65.2	1.86	
Willard	......	......	......	0.18	
Wilsonville*[1]	92	32	61.3	1.26	
Wisner	......	......	......	2.82	
Woodlawn	......	......	......	2.13	
York*[1]	88	40	60.8	2.24	
Nevada.					
Austin	84	29	53.6	0.61	
Battle Mountain*[1]	93	36	58.8	0.35	
Beowawe*[1]	94	40	53.8	0.00	
Candelaria[c]	89	32	62.7	0.55	
Carlin*[1]	94	30	60.0	0.10	
Carson City	86	25	59.3	0.20	
Cloverdale*[1]	87	50	64.1	1.16	
Clover Valley	......	......	......	0.18	
Cranes Ranch	......	......	......	1.11	
Darrough Ranch	......	......	......	0.33	
Downeyville	99	32	67.3	0.53	
Duckwater	92	30	60.2	0.77	
Elko*[8]	88	34	57.2	T.	
Elko (near)	96	24	58.3	T.	
Ely	85	18	54.6	1.35	
Empire Ranch	94	35	64.2	1.31	
Fenelon*[1]	85	28	56.0	0.35	
Golconda*[1]	92	48	64.6	0.15	
Halleck*[1]	94	34	56.8	1.00	
Hamilton	86	15	53.0	0.96	
Hawthorne *a**[8]	88	47	66.4	0.23	
Hawthorne *b*	91	34	64.0	0.23	
Hot Springs*[1]	93	50	69.1	0.05	
Humboldt*[1]	91	40	63.5	0.40	
Keysers Springs	......	......	......	0.50	
Lewers Ranch	85	28	58.2	0.20	
Nevada—Cont'd.					
Los Vegas[g]	87	44	68.2	0.22	
Lovelock*[1]	96	50	66.8	T.	
McGill	86	20	56.4	0.77	
Midas	82	31	58.4	1.12	
Mill City*[1]	95	45	64.4	0.00	
Monitor Mill	88	12	53.8	1.33	
Osceola	87	32	60.1	0.52	
Palisade*[1]	81	40	61.7	0.20	
Palmetto	87	28	56.6	1.10	
Reno*[8]	88	39	60.6	......	
Reno State University	86	28	58.4	1.73	
Ruby Valley	......	......	......	0.69	
St. Thomas	110	45	74.5	1.00	
San Antonio	92	31	63.0	0.30	
Silver Peak	94	39	67.2	0.10	
Sodaville	97	34	65.0	0.41	
Tecoma*[1]	90	39	58.0	T.	
Toano*[1]	88	29	59.6	1.85	
Tuscarora	80	19	53.2	1.14	T.
Tybo	90	27	59.6	0.90	
Verdi*[1]	90	32	61.1	0.40	
Wadsworth*[1]	96	40	64.6	0.30	
Wells	94	18	59.1	0.90	
New Hampshire.					
Bethlehem	76	25	53.4	5.52	
Concord	78	34	57.2	3.93	
Durham	77	35	55.0	4.94	
Grafton†	78	25	54.0	4.90	T.
Hanover	75	28	54.0	6.07	
Keene	80	26	55.6	3.62	
Lancaster	78	26	53.3	4.42	
Nashua	83	28	58.0	4.48	
Newton	77	30	55.6	4.59	
North Conway	77	28	55.0	6.55	
Peterboro	78	24	55.8	4.03	
Plymouth	82	28	55.4	4.57	
Sanbornton†	75	31	54.2	4.91	
Stratford	81	26	55.9	4.92	
West Milan	78	17	51.6	4.60	
New Jersey.					
Allaire	88	41	63.8	......	
Asbury Park	85	41	60.0	2.81	
Barnegat	86	40	61.6	2.01	
Bayonne	85	40	61.9	5.93	
Beachhaven[f]	80	46	59.0	1.42	
Belvidere	84	35	60.0	8.21	
Beverly†	86	40	62.5	5.68	
Billingsport*[1]	83	49	61.8	6.33	
Blairstown	82	36	60.2	8.97	
Boonton	83	38	60.0	7.53	
Bridgeton	84	46	64.1	4.75	
Camden	82	43	61.7	5.23	
Cape May	78	42	59.8	3.25	
Cape May C. H.†	83	42	60.3	2.50	
Charlotteburg	81	29	57.0	8.23	
Chester	80	35	57.8	7.66	
Clayton	83	40	61.2	3.93	
College Farm†	82	44	61.3	6.45	
Deckertown	82	33	59.5	4.26	
Dover	84	34	59.0	8.85	
Egg Harbor City	85	38	60.6	3.55	
Egg Island	......	......	......	3.44	
Elizabeth†	86	41	62.3	6.37	
Englewood	85	34	59.2	8.58	
Franklin Furnace	82	33	58.2	5.16	
Freehold	82	41	60.9	5.14	
Friesburg	......	......	......	3.79	
Gillette	85	37	59.0	6.30	
Hammonton	......	......	......	4.69	
Hanover	81	40	59.0	7.18	
Hightstown	84	40	62.8	6.06	
Imlaystown	85	39	62.5	5.34	
Junction	......	......	......	8.76	
Lambertville	83	36	60.8	8.80	
Moorestown	84	40	61.4	5.38	
Newark *a*	83	46	61.9	6.30	
Newark *b*†	84	44	61.7	6.56	
New Brunswick *a*	85	39	62.8	7.38	
New Brunswick *b*	81	39	59.3	6.94	
Newton	80	37	59.1	6.48	
Ocean City	77	41	58.6	1.99	
Oceanic	81	45	63.8	4.39	
Paterson	86	41	62.4	6.92	
Perth Amboy	85	40	61.0	5.25	
Plainfield	83	39	60.6	6.56	
Rancocas	......	......	......	5.91	
Readington*[6]	82[c]	50	64.8	......	
Rivervale	78	33	57.8	6.27	
Roseland	84	33	59.2	8.02	
Sergeantsville	79	39	59.4	9.11	
Somerville	86	35	61.4	7.84	
South Orange	83	43	60.7	6.69	
Staffordville	......	......	......	2.28	
Toms River	87	36	60.0	3.19	
Trenton	83	44	64.5	5.59	
Vineland	86	41	61.8	4.18	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New Jersey—Cont'd.	°	°	°	*Ins.*	*Ins.*
Woodbine	83	40	59.9	2.76	
New Mexico.					
Albert	88	41	64.7	3.00	
Albuquerque†	85	41	66.2	2.07	
Alma	89	32	64.2	0.11	
Angus V. V. Ranch	80	35	56.7	1.70	
Aztec†	85	32	59.2	1.56	
Bernalillo†	92	39	66.4	2.23	
Bluewater†	88	32	58.6	......	
Buckmans	73	27	49.8	4.66	
Deming*[8]	96	56	71.3	0.00	
East Lasvegas†	77	37	57.1	6.63	
Eddy	93	46	69.8	1.52	
Engle†	93	40	66.6	1.20	
Espanola†	82	37	60.7	3.48	
Fort Bayard	86	32	63.6	T.	
Fort Union	76	33	53.4	9.73	
Fort Wingate	82	33	59.6	0.70	
Galisteo†	80	43	62.7	4.80	
Gallinas Spring†	86	38	63.8	5.46	
Gila	95	38	69.9	0.07	
Gold Hill†	52	19	35.5	4.39	20.0
Hillsboro†	90	42	69.0	0.35	
Labelle†	69	23	45.5	5.05	23.0
Las Cruces†	92	39	69.0	1.54	
Lordsburg*[8]	90	58	75.0	0.00	
Los Lunas†	86	38	64.3	1.30	
Lower Penasco	84	43	63.6	0.85	
Monero†	81	29	53.5	2.55	
Ocate†	77	34	55.0	9.25	
Olio	93	34	64.6	1.59	
Puerto de Luna†	89	41	66.6	2.05	
Raton†	82	32	52.8	4.08	
Rincon†	94	44	71.0	0.88	
Roswell†	90	40	66.8	3.76	
San Marcial†	101	42	71.4	1.63	
Shattucks Ranch	89	34	62.6	1.26	
Springer†	84	31	59.0	5.26	
Valley Ranch	76	30	55.1	4.68	
White Oaks†	85	34	60.8	1.27	
Winsors Ranch	73	25	48.6	4.43	
New York.					
Addison	80	30	55.5	4.26	
Akron	......	......	......	2.82	
Alfred	78	29	52.5	3.35	
Angelica†	79	27	52.5	4.07	
Appleton	77	34	53.7	2.46	
Arcade	78	30	52.2	4.30	
Atlanta				2.91	
Avon	83	30	54.7	1.75	
Baldwinsville	80	35	56.8	2.22	
Bedford	83	35	57.9	9.83	
Big Sandy*[10]	75	34	53.8	......	
Binghamton†	82	30	55.5	4.88	
Bolivar	81	25	52.8	2.80	
Boyds Corners	......	......	......	5.56	
Brooklyn	75	46	61.0	6.90	
Canajoharie	81	32	57.6	3.82	
Canton	79	28	54.4	3.49	
Carmel	84	38	59.1	5.96	
Catskill	79	37	58.8	5.81	
Charlotte*[10]	76	34	49.3	......	
Chenango Forks				3.60	
Cherry Creek	......	......	......	4.02	
Cooperstown†	78	33	53.6	5.21	
Cortland	79	27	54.1	4.23	
De Kalb Junction	......	......	......	3.14	
Dryden	80	26	54.0	3.96	
Eagle Mills				4.37	
Elmira†	84	33	58.6	5.56	
Fleming	80	34	56.1	2.17	
Fort Niagara†	75	38	54.8	3.07	
Franklinville	79	28	52.8	3.40	
Friendship	81	27	53.7	2.65	
Fulton				2.07	
Garrattsville	78	30	52.6	7.30	
Glens Falls	82	30	56.9	3.81	
Gloversville	82	29	54.8	5.18	
Haskinsville				3.06	
Honeymead Brook	83	32	56.7	4.44	
Humphrey†	79	30	53.6	3.84	
Ithaca	80	32	55.3	3.84	
Jamestown	77	34	54.4	3.45	
Kings Station				6.35	
Lake George	76	29	55.5	4.52	
Little Falls	78	31	54.2	4.39	
Lockport	79	35	57.0	2.30	
Lowville	76	28	53.2	3.97	
Lyons	80	35	56.3	1.84	
Madison Barracks†	......	28	......	3.99	
Manhatton Beach	74	40	56.4	4.23	
Middletown	75	39	58.0	2.92	
Mohonk Lake	77	40	56.8	3.92	
Mount Morris	......	......	......	2.55	
Newark Valley	......	......	......	4.01	
New Lisbon	79	23	52.0	4.40	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New York—Cont'd.	°	°	°	*Ins.*	*Ins.*
Niagara Falls	......	......	......	3.23	
North Hammond†	72	32	55.0	3.91	
North Lake	78	27	51.6	4.41	
Number Four†	75	26	50.2	3.99	
Ogdensburg	75	36	55.2	2.86	
Oneonta	85	29	56.2	7.42	
Oxford	80	26	55.0	5.47	
Palermo†	81	27	54.0	2.99	
Perry City	80	26	54.2	3.69	
Phœnix	......	......	......	2.59	
Pine City	......	......	......	4.55	
Pittsford	82	32	54.4	2.10	
Plattsburg Barracks†	75	33	53.7	3.41	
Port Jervis	83	34	58.2	5.57	
Potsdam	77	31	54.6	3.30	
Poughkeepsie	83	30	57.8	3.36	
Primrose	86	34	58.9	6.18	
Ridgeway	75	36	54.2	2.77	
Rome	83	31	55.8	4.12	
Romulus	81	32	56.0	4.80	
Rose	......	......	......	2.12	
St. Johnsville	79	30	54.7	4.38	
Saranac Lake	78	23	52.9	3.41	
Scottsville	......	......	......	1.89	
Setauket†	81	41	58.6	5.38	
Sherwood	......	......	......	3.67	
Skaneateles	......	......	......	3.31	
South Canisteo	82	26	53.5	3.18	
Southeast Reservoir	......	......	......	6.03	
South Kortright†	79	24	53.6	5.33	
Straits Corners	80	27	54.4	4.27	
Tyrone	......	......	......	1.05	
Wappingers Falls	84	34	61.1	3.92	
Warwick	......	......	......	4.13	
Watkins	......	......	......	3.53	
Waverly†	84	27	56.0	3.66	
Wedgwood	83	33	54.7	3.72	
Westfield	79	37	55.2	3.48	
Westpoint†	87	38	60.6	4.70	
Willetspoint	83	44	59.4	5.90	
North Carolina.					
Abshers	87	38	61.7	3.30	
Asheville†	84	35	59.8	3.59	
Beaufort†	82	50	67.8	5.27	
Biltmore†	84	35	60.2	2.59	
Bryson City†	......	......	......	3.55	
Chapelhill†	37[c]	40[c]	64.8[c]	6.98	
Edenton	86	41	67.3	6.22	
Experimental Farm	86	43	66.3	3.39	
Fairbluff†	......	......	......	3.10	
Falkland	......	......	......	2.38	
Fayetteville†	91	45	67.5	5.88	
Flatrock	83	32	59.4	3.66	
Goldsboro†	92	45	67.8	4.13	
Greensboro†	88	39	64.8	3.58	
Henderson†	87	41	66.1	3.42	
Highlands	76	28	55.4	2.10	
Jacksonville	90	45	67.6	3.10	
Lenoir*†[1]	80	41	63.1	2.70	
Linville†	73	30	52.2	4.54	T.
Littleton†	86	35	63.6	4.46	
Louisburg†	87	......	......	4.05	
Lumberton†	92	48	69.3	5.39	
Lynn*†[2]	85	......	63.0	3.09	
Marion	86	37	62.8	3.34	
Moncure†	85	40	65.2	3.15	
Monroe†	88	42	65.2	3.63	
Morganton†	87	38	64.6	1.97	
Mountairy†	84	37	61.4	3.89	
Mount Pleasant	86	43	65.7	2.19	
Murphy†	......	......	......	2.97	
Newbern†	86	52	68.2	2.68	
Oakridge†	85	39	63.6	5.53	
Pantego*[3]	88	48	64.3	6.85	
Pittsboro†	83	39	64.0	5.09	
Rockingham†	92	46	68.5	2.40	
Roxboro†	85	36	63.2	4.61	
Salem†	86	38	64.2	3.03	
Salisbury†	89	42	66.6	4.73	
Saxon†	89	32	64.6	6.96	
Selma	89	40	66.4	3.27	
Settle	88	40	64.8	3.94	
Skyuka	75	50	61.1	2.36	
Sloan†	91	43	67.4	3.84	
Soapstone Mount†	87	38	64.4	3.87	
Southern Pines *a*†	92	41	68.0	2.52	
Southern Pines *b*	89	46	68.3	2.60	
Southport†	82	46	68.0	3.11	
Springhope*[1]	85	42	64.3	2.00	
Tarboro	90	37	66.2	3.46	
Waynesville†	83	34	58.2	0.99	
Weldon†	86	38	64.8	2.89	
Willeyton	85	38	64.8	4.49	
North Dakota.					
Amenia	90	25	53.8	1.12	
Ashley†	97	19	54.6	0.77	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
North Dakota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Bordulac	88	23	54.6	1.22	T.
Bottineau	82	26	52.0	......	
Buxton	86	25	54.1	1.56	
Churchs Ferry	93	24	56.0	0.55	
Coalharbor†	91	27	55.8	0.79	
Devils Lake†	89	26	54.8	0.80	
Dickinson†	88	22	56.0	0.73	
Dunseith	......	24	......	0.06	
Falconer	94	24	57.1	0.09	
Fargo†	89	23	54.8	0.74	
Forman†	93	22	57.6	0.35	
Fort Berthold†	93	30	55.8	1.77	
Fort Yates†	93	24	58.3	0.80	
Gallatin†	96	16	55.8	0.79	0.1
Glenullin	91	......	......	0.84	
Grafton†	89	25	52.8	0.20	
Grand Rapids†	92	20	53.8	0.72	0.2
Hamilton	90	25	52.6	1.84	0.2
Jamestown†	84	28	55.4	1.03	
Langdon†	87	21	52.0	1.19	
Larimore†	90	21	52.1	0.35	
Lisbon†	92	22	55.9	0.76	
McKinney	94	24	56.2	0.32	
Mayville	94	27	56.7	0.78	
Medora†	95	26	57.5	0.38	
Milton†	90	23	53.0	T.	
Minnewaukon	90	23	55.2	0.46	
Minot†	95	25	58.0	0.66	
Minto†	92	23	54.2	0.83	
Napoleon†	90	21	55.3	0.67	
Neche†	93	23	53.2	0.91	
New England City	89	26	57.2	0.12	
Oakdale†	87	28	57.4	0.67	
Portal†	94	25	57.8	0.34	
Power†	94	24	57.2	0.88	
St. John†	87	25	52.0	1.00	T.
Sheyenne	91	20	54.9	0.69	
Steele†	90	21	55.2	1.04	
Towner†	93	24	54.7	0.00	
University†	86	25	53.6	1.76	T.
Valley City†	82	24	52.0	0.42	
Wahpeton†	98	24	58.4	0.87	
White Earth	90	27	59.4	0.08	
Wildrice†[2]	......	......	56.1	0.62	T.
Willow City	90	20	54.0	0.58	
Woodbridge†	88	20	52.3	0.65	
Ohio.					
Akron	80	34	55.4	5.13	
Annapolis	84	29	55.8	2.25	
Ashland	79	35	54.9	4.58	
Ashtabula	81	33	54.0	2.71	
Atwater	......	......	......	3.02	
Auburn	......	29	......	4.32	
Bangorville	80	32	55.6	4.08	0.5
Basil	......	......	......	2.83	
Bellefontaine	83	30	56.2	5.77	0.5
Bement	......	......	......	5.55	
Benton Ridge	85	33	57.2	5.38	0.2
Bethany	88	33	59.0	3.30	3.0
Bigprairie	81	32	54.8	4.03	
Binola	84	36	59.0	6.35	
Bissells	80	33	50.8	5.11	
Bladensburg	82	30	54.5	1.83	
Bloomingburg	85	32	57.6	3.43	T.
Bowling Green	81	32	55.5	2.92	
Bucyrus	80	36	56.2	4.42	
Cambridge	82	30	55.4	3.00	
Camp Dennison	85	35	59.2	2.86	T.
Canal Dover	83	29	55.7	3.81	T.
Canfield	......	......	......	2.80	
Canton†	82	32	55.9	4.39	
Carrollton	83	28	55.6	3.18	T.
Cedarville	......	......	......	4.01	T.
Cherryfork	91	33	59.7	6.16	
Chillicothe†	83	35	58.3	4.87	T.
Circleville	82	34	58.3	3.08	
Clarksville	84	32	57.5	3.90	2.0
Cleveland *a*	82	38	55.0	4.95	
Cleveland *b*	81	36	55.0	4.00	
Clifton	85[d]	32[d]	54.7[d]	4.59	3.0
Coalton	86	33	58.9	3.96	T.
Colebrook	80	30	55.1	4.81	
Dayton *a*	87	32	58.4	3.51	0.5
Dayton *b*†	......	......	......	3.57	T.
Defiance	83	32	55.0	3.14	
Delaware	83	33	57.4	4.44	
Demos	81	32	56.6	3.64	T.
Dupont	82	32	55.5	3.70	T.
Elyria	83	37	55.2	4.31	
Fairport Harbor*[10]	82	40	55.9	......	
Fayetteville	84	33	58.2	3.98	3.0
Findlay	85	34	57.2	4.25	
Frankfort	78	34	54.6	3.79	T.
Garrettsville†	80	29	53.6	4.76	
Granville	82	32	56.0	4.34	
Gratiot	82	31	56.4	2.89	0.5

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd	°	°	°	*Ins.*	*Ins.*
Greenfield	82	35	59.6	3.10	T.
Greenhill	82	27	54.0	2.69	T.
Greenville	82	34	55.3	4.37	2.0
Hackney	......	......	......	3.66	T.
Hanging Rock	88	36	60.7	4.58	T.
Hedges	82	32	56.0	3.43	
Hillhouse	81	28	53.2	4.44	
Hillsboro†	89	33	58.8	3.56	0.5
Hiram	79	33	54.6	5.01	
Jacksonboro	87	32	58.3	3.60	3.0
Kenton†	84	32	56.8	5.06	
Killbuck	82	29	56.1	2.74	
Lancaster	82	33	57.0	3.25	
Leipsic	84	30	56.2	3.44	
Levering	82	......	......	3.87	
Logan	86	33	58.4	2.69	
Lordstown	81	30	54.4	3.55	
Lowell	86	30	58.1	4.26	T.
McArthur	85	33	57.0	4.52	
McConnelsville†	83	33	56.9	3.68	T.
Mansfield†	......	......	......	5.89	
Marietta *a*†	......	......	......	3.90	
Marietta *b*	86	35	59.1	4.20	
Marion	83	32	56.6	5.97	
Medina	81	32	55.0	7.17	
Milfordton	82	32	55.4	3.12	
Milligan	87	32	58.5	2.23	T.
Millport	78	26	53.6	3.23	
Montpelier	80	34	55.3	2.67	
Napoleon	83	32	56.2	2.27	
Neapolis	......	......	......	4.48	
New Alexandria	81	33	53.0	2.81	0.5
New Berlin	82	29	55.0	3.95	
New Bremen	84	32	57.4	3.04	
New Comerstown	84	35	56.6	4.24	
New Holland	83	34	57.6	1.88	0.2
New Paris	85	31	58.3	1.83	
New Waterford	......	......	......	2.60	
North Lewisburg	84	33	57.2	4.80	1.0
North Royalton	81	33	55.0	6.28	
Norwalk	83	33	54.8	3.19	
Ohio State University	82	32	56.2	3.55	T.
Orangeville	80	29	54.8	4.00	
Ottawa	83	33	57.7	4.00	T.
Pataskala†	84	33	57.1	3.41	2.0
Perry	......	......	......	3.62	
Philo	84	31	57.2	3.21	T.
Plattsburg	82	30	56.6	3.53	2.0
Pomeroy	87	36	59.9	5.44	T.
Portsmouth *a*†	......	......	......	5.11	T.
Portsmouth *b*	91	36	62.0	4.93	
Ridgeville Corners	83	33	55.3	2.75	
Ripley	87	33	58.9	7.40	
Rittman	80	29	53.3	5.19	
Rockyridge	84	35	57.2	3.16	
Rosewood	80	31	56.1	4.80	
Shenandoah	81	32	54.6	4.88	
Sidney *b*	83	30	56.8	5.41	
Sinking Spring†	83	35	59.0	4.88	T.
Springboro	......	......	......	3.20	4.0
Spring Valley	85	32	55.8	3.84	
Strongsville	......	......	......	5.99	
Sylvania	83	31	54.8	3.53	
Thurman	88	34	57.4	3.28	
Tiffin†	80	36	56.4	4.86	0.2
Upper Sandusky	81	33	57.1	5.84	
Urbana	79	32	56.2	3.88	2.0
Vanceburg	85	35	59.7	7.09	T.
Van Wert	82	36	56.4	4.15	0.5
Vermilion	83	35	55.0	4.29	
Vickery	82	34	56.7	4.04	
Walnut	......	......	......	4.12	0.5
Warren	82	31	55.8	3.98	
Wauseon	83	33	56.4	3.90	
Waverly	88	34	60.1	3.86	0.8
Waynesville	81	31	55.4	3.60	3.0
Wellington	82	35	60.0	5.42	
Westerville	79	35	56.2	3.38	1.0
Willoughby	......	......	......	3.38	
Wooster *a*	......	......	......	5.23	
Wooster *b*†	78	31	53.4	4.97	
Youngstown	83	30	55.4	2.75	
Oklahoma.					
Alva	95	45	68.8	4.00	
Anadarko†	90	49	68.0	7.12	
Arapaho†	91	42	67.2	8.80	
Beaver	......	......	......	5.69	
Burnett†	86	39	66.0	5.85	
Clifton†	91	39	67.4	3.61	
Edmond	88	44	66.6	6.29	
Fort Reno†	85	42	65.6	6.07	
Fort Sill	86	43	67.2	8.07	
Hennessey	89	45	68.6	7.22	
Kingfisher	88	42	66.4	7.13	
Mangum†	89	42	67.0	3.52	
Norman†	90	47	68.3	6.07	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Oklahoma—Cont'd.	°	°	°	*Ins.*	*Ins.*
Ponca	90	36	65.2	3.05	
Pondcreek†	93	40	67.4	4.96	
Prudence†	92	36	66.2	8.26	
Sac and Fox Agency†	88	40	66.0	3.90	
Stillwater†	88	41	65.4	4.77	
Waukomis	92	40	66.0	5.38	
Winnview†	89	45	66.3	7.42	
Woodward	93	40	68.4	3.71	
Oregon.					
Albany *a*	93	37	60.9	1.07	
Arlington	95	37	65.0	0.30	
Ashland *b*	95	32	61.2	0.84	
Aurora *[8]	98	45	65.4	0.69	
Aurora (near)	95	31	59.1	1.07	
Bandon	66	39	53.2	0.42	
Bay City†	......	......	......	3.40	
Brownsville *[8]	90	48	64.2	1.33	
Burns†	88	21	55.4	T.	
Burns (near)[k]	87	26	56.6	......	
Canyon City	95	29	60.2	0.00	
Cascade Locks	92	42	62.4	1.33	
Corvallis *a*	95	36	58.2	1.09	
Dayville†	95[k]	30[k]	62.8[k]	0.96	
Eugene *a*†	91	36	58.8	1.50	
Falls City	......	......	......	1.74	
Fife†	87	22	52.2	......	
Forest Grove	98	34	60.8	0.52	
Fort Klamath	84	25	53.7	2.70	T.
Gardiner	80	39	56.6	1.52	
Glenora	99	29	58.4	2.45	
Government Camp	81	23	48.9	2.88	10.0
Grants Pass *a*†	97	32	63.0	0.74	
Happy Valley	88	19	54.6	1.39	
Hood River (near)	89	36	60.4	0.81	
Irvington	......	......	......	0.86	
Jacksonville	92	32	60.0	0.57	
Joseph	85	29	55.6	0.46	
Junction City *[8]	94	40	60.3	1.36	
Lafayette *[8]	98	44	64.3	1.15	
Lakeview†	88	25	57.8	0.92	
Langlois	86	39	59.4	1.85	
Merlin *[8]	102	44	65.8	0.41	
Monmouth *[8]	92	45	64.2	0.90	
Mount Angel†	97	35	62.0	1.48	
Nehalem	......	......	......	2.19	
Newport	83	38	53.2	2.29	
Pendleton	103	29	63.5	1.21	
Prineville	96	25	60.2	0.97	
Riddles *[8]	99	31	58.6	0.46	
Salem *b*†	93	36	59.6	1.78	
Sheridan *[8]	89	45	64.1	0.95	
Silver Lake	89	16	54.8	1.91	
Silverton *[8]	98	44	62.4	1.21	
Siskiyou *[8]	90	35	60.1	......	
Sparta	84	30	56.4	2.08	
Springfield *[8]	89	45	61.7	0.98	
Stafford	96[c]	34[c]	59.4[c]	1.27	
The Dalles†	95	38	64.4	0.27	
Tillamook Rock L. H	......	......	......	1.87	
Vale	95	27	62.5	1.99	
Vernonia	106	29	60.4	1.22	
West Fork *[8]	103	32	58.9	0.70	
Weston	97	36	62.0	1.20	
Williams	91	29	59.8	0.91	
Pennsylvania.					
Altoona	83	39	60.3	2.52	
Aqueduct	83	35	62.4	5.93	
Beaver Dam	......	......	......	2.87	
Bethlehem	......	......	......	6.05	
Blooming Grove	81	31	55.3	6.87	
Brookville†	......	......	......	1.71	
Browers Lock	......	......	......	7.00	
Cameron	......	......	......	3.85	
Canonsburg	82	35	58.0	1.79	0.5
Carlisle	82[e]	38[e]	60.8[e]	6.54	
Cassandra	78	33	54.4	4.18	
Cedarrun	......	......	......	2.26	
Centerhall†	79	35	57.9	5.79	
Chambersburg†	81	34	57.6	6.03	
Coatesville	84	37	61.5	7.28	
Confluence†	83	33	57.6	3.91	
Coopersburg	78	38	59.8	8.74	
Davis Island Dam†	......	......	......	3.57	
Derry Station	84	31	57.4	4.03	
Doylestown	......	......	......	7.89	
Drifton	79[f]	34[f]	55.6[f]	4.86	
Driftwood	......	......	......	4.40	
Dubois	......	......	......	4.11	
Duncannon	......	......	......	6.06	
Dunmore	82	27	57.0	5.15	
Dushore	80	25	54.9	4.87	
East Bloomsburg	......	......	......	7.05	
East Mauch Chunk	84	35	59.5	7.64	
Easton	80	39	61.2	5.75	
Edinboro *[1]	75	36	53.6	......	
Ellwood Junction†	......	......	......	2.61	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Pennsylvania—Cont'd.	°	°	°	*Ins.*	*Ins.*
Emporium	83	33	56.8	3.42	
Farrandsville	......	......	......	4.53	
Forks of Neshaminy *[1]	76	50	64.3	6.34	
Franklin	82	33	55.1	3.66	
Frederick	......	......	......	8.85	
Freeport†	......	......	......	3.65	
Girardville	......	......	......	8.27	
Grampian	80	32	55.4	4.55	
Greensboro†	87	32	59.0	4.93	T.
Greenville	80	31	54.3	4.10	
Hallstead†	80[d]	29[d]	56.2[d]	4.87	
Hamburg	82	42	63.0	8.15	
Hollidaysburg	87	31	58.3	3.52	
Honesdale	......	......	......	5.92	
Huntingdon *a*†	87	33	58.2	4.69	
Huntingdon *b*	......	......	......	4.94	
Indiana	79	32	56.8	2.98	
Irwin	......	......	......	2.79	T.
Johnstown†	83	34	57.0	3.71	
Karthaus	......	......	......	2.65	
Keating	......	......	......	4.34	
Kennett Square	80	39	60.7	7.96	
Lancaster[k]	81	36	56.8	......	
Lansdale	......	......	......	8.62	
Lawrenceville	82	28	57.6	4.35	
Lebanon	76	35	59.8	6.52	
Leroy†	78	33	55.0	4.84	
Lewisburg	80	32	58.4	4.30	
Lock Haven *a*†	88	33	60.7	5.00	
Lock Haven *b*	......	......	......	4.65	
Lock No. 4†	......	......	......	2.63	
Lycippus	81	34	57.6	4.08	
Mifflin	......	......	......	4.62	
Oil City†	......	......	......	4.12	
Ottsville	......	......	......	7.81	
Parker†	......	......	......	3.41	
Philadelphia *b*	82	44	63.0	4.96	
Point Pleasant	......	......	......	9.98	
Pottstown	83	43	63.0	7.[illegible]7	
Quakertown	82	36	59.4	7.77	
Reading[2]	......	......	60.4	9.70	
Renovo *a*	......	......	......	4.64	
Renovo *b*	87	35	58.9	4.41	
Ridgway†	......	......	......	3.81	
Saegerstown	82	26	53.7	3.95	
St. Marys	80	31	53.7	3.44	
Salem Corners	77	39	55.8	5.84	
Scranton	81	35	58.0	4.82	
Seisholtzville	......	......	......	8.58	
Selinsgrove	80	32	58.6	4.74	
Shawmont	......	......	......	5.54	
Shinglehouse	82	25	53.4	3.20	
Skippack	81	32	58.6	9.25	
Smethport	80	28	53.2	2.90	
Smiths Corners	......	......	......	10.05	
Somerset	79	30	52.6	4.65	
South Bethlehem	80	39	59.5	......	
South Eaton	78	33	56.8	5.29	
State College	81	36	57.6	4.13	
Sunbury	......	......	......	1.60	
Swiftwater	78	34	55.5	6.61	
Towanda	81	31	56.7	3.74	
Uniontown	80	31	56.6	4.52	
Warren†	81	32	55.5	4.20	
Wellsboro†	78	30	53.7	5.53	
West Chester	80	42	60.5	7.47	
West Newton†	......	......	......	3.08	
White Haven	79	35	54.8	6.49	
Wilkesbarre†	84	33	59.6	5.81	
Williamsport	80	36	59.0	2.85	
York†	80	37	60.1	6.61	
Rhode Island.					
Bristol	71	39	55.9	4.28	
Kingston	78	36	55.8	3.95	
Providence *a*	84	41	60.4	4.46	
South Carolina.					
Allendale†	96	47	71.9	2.65	
Anderson†	......	......	......	1.73	
Batesburg†	95	48	68.5	3.50	
Blackville†	93	45	69.8	4.28	
Camden†	......	......	......	3.68	
Central†[e]	92	42	67.8	......	
Cheraw *a*†	94	38	68.6	3.94	
Cheraw *b*†	......	......	......	4.42	
Clemson College	90	42	67.0	0.81	
Conway†	......	......	......	3.15	
Darlington (near)	......	......	......	1.58	
Edisto†	......	......	......	0.99	
Effingham†	......	......	......	4.07	
Florence†	92	45	67.8	3.32	
Georgetown†	86	52	69.2	2.75	
Gillisonville†	97	45	72.2	1.00	
Greenville†	86	42	64.4	2.88	
Greenwood	92	43	69.4	2.20	
Holland	93	40	66.6	1.19	
Kingstree *a*†	92	49	70.4	2.73	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Little Mountain	91	42	69.4	2.78	
Longshore †	93	43	69.1	2.54	
Mount Carmel †				2.97	
Pinopolis *[1]	89	52	69.1	1.19	
Port Royal †	94	53	73.0	1.47	
St. George †	94	48	70.7	0.88	
St. Matthews †	95	47	70.5	2.36	
St. Stephens †				5.17	
Santuck †	91	42	66.6	3.61	
Shaws Fork *[1]	90	54	70.2	2.33	
Smiths Mills †				3.39	
Society Hill †	88	49	68.0	2.09	
Spartanburg	93	43	67.9	1.52	
Statesburg †	91	47	71.1	2.08	
Trenton	92	45	71.6	2.80	
Trial †	92	46	69.2	1.67	
Walhalla	90	40	64.6	1.20	
Winnsboro	93	44	69.4	2.07	
Yemassee †	96	47	71.7	1.07	
Yorkville	89	44	68.6	2.27	
South Dakota.					
Aberdeen †	96	25	57.7	0.33	
Alexandria †	87	26	55.8	0.49	
Armour †	87	30	58.6	3.40	
Ashcroft †	91	23	58.2	1.72	
Brookings	89	26	56.1	0.83	
Canton	88	24	58.0	0.61	
Castlewood †	89	21	55.3	1.37	
Centerville				1.09	
Chamberlain †	91	31	60.2	1.24	
Clark [5]	86	28	52.4	0.65	
Cross †	84	24	54.9	1.64	
Doland	87	20	56.0	1.33	
Edgemont				0.51	
Farmingdale				1.43	
Faulkton	88	26	57.6	0.29	
Forestburg †	88	30	59.0	0.93	
Fort Meade †	88	34	61.6	1.07	
Gary	92	29	54.8	1.86	2.0
Goudyville	91	20	56.6	0.21	
Greenwood †	85	32	60.2	2.13	
Highmore	90	26	59.9	1.86	
Hotch City †	90	26	59.6	0.97	
Hot Springs	85	28	59.6	0.67	
Howard †	86	24	56.2	1.02	
Kimball †	92	27	58.7	1.00	
Leslie †	93	24	62.7	T.	
Mellette †	91	25	58.4	0.38	
Menno †	89	27	60.0	0.76	
Millbank	90	26	56.2	2.05	
Mitchell †	87	26	56.7	1.36	
Nowlin †	97	26	58.5	0.05	
Oelrichs †	94	26	61.4	0.30	
Parker †	87	28	57.7	0.71	
Parkston	86[c]	25[c]	56.2[c]	2.10	
Plankinton †	92	28	58.9	0.68	
Rosebud	92	19	57.0	3.02	
Shiloh	90	20	57.3	0.25	
Silver City				2.31	
Sioux Falls †	88	26	57.1	1.25	
Spearfish †	86	30	61.2	2.80	
Tyndall †	88	31	59.5	0.79	
Vermillion	90	30	60.1	0.31	
Watertown	84	20	54.2	1.13	
Webster †	90	22	54.5	0.84	1.4
Wentworth †	86	25	55.6	4.97	
Wessington Springs	88	27	59.1	0.68	
Tennessee.					
Andersonville	85	38	62.2	3.36	
Arlington †	95	40	65.7	0.81	
Ashwood *†[1]	87	45	66.2	3.73	
Benton (near) †	87	41	63.9	2.24	
Bolivar †	89	36	64.4	1.09	
Bristol †	83	35	58.5	3.37	
Brownsville †	90	44	67.0	1.08	
Byrdstown	87	37	62.4	3.71	
Cagle	81	41	62.4	3.40	
Carthage †				1.79	
Center Point				2.05	
Charlotte	87	35	63.4	0.62	
Clarksville	84	40	62.9	1.09	
Clinton †				4.59	
Covington	91	41	67.0	0.72	
Decatur †	87	36	63.6	6.89	
Dyersburg	91	42	66.8	1.32	
Elizabethton †	84	34	60.4	4.34	T.
Elk Valley	86	36	61.8	3.74	
Erasmus	84	32	59.0	4.43	
Fairmount *[1]	80[h]	43[j]	61.0[j]	3.21	
Florence †	86	39	63.4	1.57	
Franklin	87	37	63.6	1.06	
Greeneville †	83	36	60.1	4.95	
Harriman	86	38	62.6	5.39	
Hickory Withe	90	42	66.3	0.94	
Hohenwald †	88	30	61.8	2.08	
Jackson †	88	39	65.1	1.18	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*
Johnsonville †				0.77	
Jonesboro *†[1]	79	39	59.6	4.64	T.
Liberty †	87	40	63.9	3.21	
London †				4.70	
Lynnville †	88	40	64.0	3.16	
McKenzie †	89	37	64.7	0.60	
McMinnville †	84	38	62.6	5.60	
Milan †	92	40	65.0	0.90	
Molino †	90	37	65.4	4.84	
New Market				4.36	
Newport †	85	41	62.2	4.49	
Nunnelly *[1]	88	45	64.4	1.04	
Oak Hill *[1]	83	39	60.9	3.27	
Palmetto †	86	38	64.8	2.72	
Paris Landing *[1]	85	40	63.9	0.20	
Pope	90	41	66.6	2.21	
Riddleton †	84	38	62.8	1.19	
Rockwood †				2.94	
Rogersville †	81	38	59.9	4.66	
Rugby	83	34	60.0	3.99	
St. Joseph †	92	33	65.0	2.75	
Savannah	92	39	65.9	1.83	
Sewanee †	80	43	61.4	0.10	
Springdale *[1]	84	40	60.8	4.66	
Springfield *[1]	90	40	64.2	0.89	
Tellico Plains †	90	40	64.2	2.93	
Trenton	87	37	63.7	0.98	
Tullahoma †	83	33	60.4	3.85	
Union City †	89	39	65.6	1.58	
Waynesboro	90	34	63.2	1.59	
Texas.					
Albany *[1]	75	46	65.8	4.23	
Arthur City †				4.23	
Austin *b* *[5]	88	48	73.8		
Ballinger †	91	45	69.9	3.75	
Beeville †	95	53	77.4	4.20	
Blanco †	90	52	72.0	0.51	
Boerne *†[1]	86	55	72.9	1.45	
Bowie	86	48	68.9	6.72	
Brazoria †	87	53	73.7	3.05	
Bremond *[1]	90	57	74.0	6.57	
Brenham †	93	53	74.6	1.62	
Brighton †	95	53	76.0	1.11	
Brownwood	93	41	71.4	7.52	
Burnet *[1]	89	54	73.7	1.75	
Camp Eagle Pass †	97	60	78.4	3.44	
Childress *[1]	92	46	66.9	5.15	
Coleman *[3]		51	68.2	5.14	
Columbia †	88	52	71.9	2.80	
Corsicana *b* †	94	54	74.0	6.17	
Cuero †	90	52	74.8	2.23	
Dallas †	91	46	70.9	4.13	
Danevang †	92	50	73.6	3.77	
Dean	84	43	59.6	1.62	
Dublin †	89	45	68.4	6.26	
Duval *[1]	93	59	77.8	1.59	
Emory		44		3.19	
Estelle †	90	44	70.1	4.85	
Forestburg †	87	50	68.4	9.39	
Fort Clark	92	52	74.6	2.08	
Fort McIntosh	95	60	76.9	3.48	
Fort Ringgold †	95	55	77.2	3.95	
Fort Stockton				1.36	
Fort Worth †	92[d]	48[d]	72.2[d]	5.01	
Fredericksburg *†[1]	88[d]	48	72.2[c]	2.04	
Gail				5.20	
Gainesville †	86	44	68.9	6.02	
Georgetown *[1]	87[f]	46	69.8[e]	4.20	
Golindo				6.40	
Grapevine †	88	47	69.9	5.99	
Hale Center †	87	50	66.6	5.26	
Hallettsville †	92	52	74.8	2.86	
Hearne †	94	52	76.4	4.25	
Henrietta †	89	46	69.6	6.83	
Hewitt				7.50	
Houston †	86	53	73.3	7.16	
Huntsville †	91	50	73.6	1.50	
Junction City	91[d]	43[d]	72.0[d]	4.11	
Kent				0.37	
Kerrville †	86	40	70.2	3.62	
Lampasas †	89	43	72.0	3.41	
Llano *†[5]	90	54	74.6	0.82	
Longview †	95	49	73.4	6.76	
Lufkin †	96	50	74.2	5.54	
Luling †	90	54	75.2	1.65	
Mann	94[f]	53[j]	69.8[h]	5.74	
Marathon	90	43	67.8	1.40	
Marshall	90	51	72.4	3.26	
Menardville	96[e]	49[e]	71.7[e]	3.55	
Midland	100	36	71.6	4.55	
Mount Blanco †	86	40	66.9	0.16	
New Braunfels †	88	52	73.6	1.75	
Orange †	88	49	70.8	1.06	
Panter †				4.71	
Paris †	91	44	70.0	4.38	
Point Isabel *[1]	86	70	79.8	0.20	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Texas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Rheinland †	90	55	68.7	6.68	
Rocksprings				4.59	
San Antonio	92	56	76.4	3.20	
Sanderson †	94	46	71.8	2.40	
San Marcos *b* †	93	48	73.9	2.40	
Sierra Blanca †	98	40	70.0	0.72	
Stafford †	96	49	74.3	7.77	
Sulphur Springs †	95	46	73.6	6.14	
Temple *a*	87	56	72.2	3.07	
Temple *b*	91[c]	42[c]	72.5[c]	1.65	
Tivoli	91	54	74.0	5.07	
Tulia	84	42	64.2	2.78	
Tyler	93	49	72.0	6.27	
Valentine †	92	42	66.8	2.81	
Waco †	92	48	74.4	5.81	
Waxahachie †	92	44	74.5	6.60	
Weatherford †	89	49	70.5	5.07	
Wichita Falls †				6.60	
Utah.					
Alpine City †				1.31	
Blue Creek *[8]	102	38	67.9	0.20	
Brigham City †				0.38	
Cisco †	97	39	66.0	0.20	
Corinne	91	31	63.2	0.17	
Croydon	91	15	58.1	0.80	
Ferron	96	31	54.5	0.15	
Fillmore †	98	23	61.6	0.03	
Fort Duchesne †	88	29	59.9	0.16	
Frisco	89	32	59.0	0.20	0.2
Giles †	97	35	66.4	0.24	
Green River †	87	37	59.1	0.30	
Heber	88	22	56.8	0.70	
Koosharem	83	30	54.0	0.59	
Levan †	90	29	59.8	0.85	
Loa †	89	21	54.3	0.71	
Logan †	85	32[d]	60.8	0.56	
Mammoth †	93	30	61.6	0.18	
Manti †	98	28	62.3	T.	
Millville				0.49	
Minersville	92	31	62.2	0.28	
Moab †	95	41	67.7	0.38	
Mount Pleasant †	99	30	63.2	0.58	
Ogden *a* *[8]	96	42	68.9	0.30	
Ogden *b*	92	32[c]	65.1	0.35	
Pahreah	95	40	65.4	0.50	
Park City †	74	30	51.2	0.08	
Parowan †	88	32	60.8	0.51	
Pinto				0.52	
Promontory *[8]	95	40	68.6	1.33	
Richfield †	89	33	60.5	0.06	
St. George †	104	31	69.2	0.15	
Scipio †	90	24	58.8	0.73	
Snowville	88	24	59.8	0.33	
Soldier Summit †	91	12	52.8	0.10	
Terrace *[8]	87	30	58.8	0.01	
Thistle †	94	26	55.6		
Tooele †	88	29	63.6	0.36	
Tropic	83	31	59.8	0.92	
Vernal	84	33	61.6	0.62	
Woodruff	80	20	49.8	0.10	
Vermont.					
Bennington	76	28	56.2	4.98	
Brattleboro	80	30	58.2	2.91	
Burlington †	74	35	57.4	5.00	
Chelsea †	75	30	52.2	5.02	
Cornwall	76	33	55.8	4.26	
Enosburg Falls	76	28	54.6	5.50	
Hartland †	78	29	54.0	6.01	
Jacksonville	72	24	51.0	3.97	
St. Johnsbury	74	28	55.0	4.33	
Strafford *†[1]	71	30	52.9	5.52	
Vernon *[6]	80	41	57.6	3.49	
Wells	76	31	55.0	5.60	
Woodstock	79	26	55.6	5.54	
Virginia.					
Alexandria	86	40	63.8	6.71	
Ashland †	87	39	64.2	3.01	
Barboursville	85	40	62.2	6.04	
Bedford City	89	34	61.2	3.70	
Bigstone Gap †	87	32	58.1	3.95	
Birdsnest *†[1]	86	51	65.0	4.65	
Blacksburg	81	30	56.2	4.23	1.0
Buckingham †	85	34	61.4	3.02	
Burkes Garden	79	29	55.6	3.89	3.0
Callaville †	84	36	63.4	3.25	
Christiansburg †				2.88	
Clarksville †				4.59	
Clifton Forge	88	37	56.2	4.46	
Danville †				4.83	
Dale Enterprise †	88	29	58.6	5.37	T.
Doswell	85	40	67.1	2.70	
Farmville	90	35	64.0	3.65	
Fredericksburg †	89	40	63.4	4.59	
Gordonsville	79	40	62.2		
Grahams Forge	83	33	58.0	2.78	T.
Guinea	91	30	59.0	6.23	

TABLE II.—*Meteorological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Hampton	84	46	65.7	5.00	
Hot Springs	84	18	60.7	5.73	
Leesburg	88	39	63.2	3.26	
Lexington †	84	33	59.6	4.63	
Maidens	......	......	......	2.16	
Manassas †	85	38	63.0	4.95	
Marion †	84	34	58.3	3.56	1.0
Monterey	78	29	55.4	7.04	
Petersburg †	88	41	65.3	3.40	
Quantico	84	32	59.9		
Radford †	......	......	......	2.89	
Richmond (near) †	88	37	65.0	2.46	
Rockymount †	85	36	63.4	5.03	
Salem †	86	39	63.0	4.03	
Saltville	83	35	58.0	3.08	
Smithville †	84	39	63.6	5.67	
Spottsville †	86	37	64.4	5.28	
Stanardsville †	85	40	60.8	4.45	
Staunton †	86	35	60.7	5.75	
Stephens City †	86	28	61.1	4.48	
Sunbeam †	79	38	60.5	4.06	
Swords Creek	84	35	58.0	4.08	
Warrenton	83	41	63.4	4.65	
Warsaw †	85	38	63.4	3.51	
Westbrook Farm	85	40	64.0	......	
Woodstock †	83	39	61.4	5.41	
Wytheville	78	33	57.0	3.26	T.
Washington.					
Aberdeen	91	37	56.5	2.90	
Anacortes	......	......	......	2.44	
Ashford †	......	......	......	3.42	
Blaine †	84	30	52.4	4.33	
Bridgeport	102	34	65.5	0.10	
Centerville †	94	29	60.1	0.29	
Chehalis †	97	32	60.1	1.42	
Colfax †	93	33	59.4	1.93	
Coupeville †	79	38	53.8	2.18	
Dayton	95	32	62.1	0.48	
Ellensburg †	90	34	61.4	0.42	
Ellensburg (near)	98	32	62.7	0.25	
Elma	90	40	60.0	0.58	
Fort Simcoe †	101	33	66.2	0.32	
Fort Spokane	95	33	62.4	0.70	
Grandmound †	92	33	57.8	1.02	
Hunters †	82	26	54.4	1.19	
Kennewick †	99	32	64.6	0.55	
La Center	98	36	60.5	0.71	
Lakeside	91	30	62.4	1.30	
Lapush †	72	38	51.4	3.42	
Loomis †	99	35	65.5	0.67	
Madrone †	85	36	56.3	1.04	
Mayfield †	97	33	59.0	2.34	
Moxee Valley †	99	30	62.7	0.26	
Northbend	92d	33d	56.7d	3.86	
Olga	78	39	54.6	2.29	
Olympia †	93	33	57.8	1.02	
Pinehill †	92	33	60.6	0.52	
Pomeroy †	96	42	66.5	1.48	
Pullman †	94	32	59.7	1.35	
Rosalia †	92	32	59.6	1.43	
Sedro †	88	36	58.8	1.89	
Silvercreek *1	94	32	57.4	2.49	
Snohomish †	88	36	58.3	2.51	
Southbend	94	34	58.7	2.58	
Stillaguamish	90	30	55.4	3.04	
Sunnyside †	99	31	64.3	0.20	
Union City †	88	38	59.0	1.16	
Vashon †	81	39	58.2	1.39	
Waterville †	96	30	59.7	1.11	
Wenatchee Lake	93	29	55.0	0.85	
West Ferndale	89	35	57.2	7.51	
West Virginia.					
Beckley	88	25	56.2	1.52	
Beverly †	80	33	58.8	5.01	4.0
Bloomery †	80	31	55.3	4.67	
Bluefield †	85	31	58.3	4.43	1.0
Buckhannon *a* †	......	......	......	5.05	0.5
Buckhannon *b*	83	34	57.2	......	......
Burlington †	85	34	57.8	5.06	
Charleston †	......	......	......	5.04	
Clay	87	35	58.7	......	2.0
Dayton †	......	......	......	3.54	
Elkhorn †	85	33	58.9	5.58	0.5
Fairmont †	......	......	......	4.46	
Glenville †	82	33	56.8	5.31	T.
Grafton †	81	32	56.2	4.81	2.2
Green Sulphur	88	31	59.1	3.05	
Harpers Ferry †	......	......	......	5.67	
Hewett †	88	35	60.8	5.67	
Hinton *a* †	......	......	......	3.56	0.1
Hinton *b* †	88	35	60.8	......	......
Huntington	84	32	59.5	4.03	......
Kingwood	78	32	55.7	5.37	......
Marlinton †	80	29	55.1	7.06	T.
Martinsburg †	83	40	60.4	5.00	
Morgantown *a* †	......	......	......	4.34	T.

Stations	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
West Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Morgantown *b* †	83	32	56.4	4.91	......
New Martinsville †	90	34	59.2	3.21	
Nuttallburg †	83	30	55.3	4.05	
Oldfields †	88	32	58.7	5.24	T.
Philippi †	79	23	55.4	5.66	T.
Pleasant Hill *1	78	36	57.8	2.85	4.0
Point Pleasant †	88	34	61.1	4.45	T.
Powellton	84	36	59.0	4.43	1.0
Romney	85	39	61.0	4.66	
Rowlesburg †	......	......	......	3.60	
Tannery *1	75	34	53.5	......	
Weston *b* * †	88	36	59.0	......	5.0
Wheeling *a* †	......	......	......	2.17	T.
Wheeling *b* †	83	38	60.4	4.58	0.5
White Sulphur Springs †	82	26	54.7	6.80	1.0
Wisconsin.					
Amherst	85	28	53.0	2.70	T.
Antigo	85	24	51.3	3.43	T.
Barron	89	21	52.7	2.17	T.
Bayfield	86	31	46.2	2.07	T.
Beloit	81	33	57.8	0.70	
Chilton	84	30	54.1	1.47	
Citypoint	89	28	56.0	5.27	
Crandon †	83	22	51.8	0.69	0.5
Delavan	81	29	55.2	1.02	
Dodgeville †	84	28	56.8	1.00	
Easton †	87	30	55.0	1.71	
Eau Claire	86	24	54.6	3.65	
Fond du Lac	85	29	54.9	1.25	
Grand River Lock	......	......	......	1.19	
Grantsburg †	88	24	53.1	2.00	
Gratiot	86	30	57.8	......	
Hartford	......	......	......	1.21	
Hartland	83	31	55.0	0.94	T.
Harvey	85	30	56.2	0.94	
Hayward †	87	17	51.6	2.34	T.
Hillsboro	87	28	54.1	1.88	
Hudson	......	......	......	2.11	
Koepenick * †1	86	34	54.4	2.10	
Lancaster †	85d	31	57.6	2.11	
Lincoln †2	......	......	53.9	3.27	T.
Madison †	79	33	56.9	0.51	
Manitowoc †	82	32	51.1	1.41	
Meadow Valley †	88	26	54.0	2.46	
Medford †	89	19	51.4	1.45	T.
Menasha	......	......	......	2.36	
Neillsville †	86	26	52.8	2.67	
New Holstein	89	30	54.8	1.49	
New London	88	29	54.5	2.26	
Oconto	86	31	52.0	2.08	T.
Osceola †	93	19	54.7	1.60	
Oshkosh †	83	31	55.5	1.28	
Pepin	88	26	52.8	1.27	
Pine River †	88	28	55.4	1.39	
Portage †	87	28	56.5	0.56	
Port Washington	84	31	51.8	1.28	
Prairie du Chien	90	32	60.1	1.32	
Racine	85	32	53.6	0.87	
Sharon †	82	29	54.0	1.57	
Shawano	84	28	51.8	2.15	
Spooner †	90	14	51.2	2.40	
Stevens Point †	86	28	54.2	2.39	
Sturgeon Bay Canal *10	74	32	48.5	......	
Valley Junction †	87	26	54.0	1.89	T.
Viroqua	85	29	55.6	1.23	
Watertown †	85	32	56.2	1.17	
Waukesha †	81	31	55.0	1.01	
Waupaca †	88	29	55.6	2.49	
Wausau †	83	27	52.6	2.20	T.
Wausaukee	82	29	51.2	1.93	
Westbend	84	30	53.4	1.10	T.
Westfield †	88	29	55.8	1.28	
Whitehall	90	30	56.1	3.64	
White Mound †	88	26	56.4	0.81	
Wyoming.					
Big Horn Ranch	74	26	52.2	0.77	
Carbon	92	27	56.4	1.46	
Fort Laramie †	90	25	60.0	1.23	
Fort Washakie †	82	25	56.6	1.75	
Fort Yellowstone †	77	23	54.0	1.55	0.5
Green River	89	23	58.1	0.30	
Laramie	74	24	50.9	1.85	
Lusk †	92	23	57.9	0.87	
Sheridan	91	26	58.8	0.49	
Strong	87	29	59.8	0.85	
Sundance	80	29	54.5	1.57	
Wheatland	91	25	59.8	0.87	
Mexico.					
Ciudad P. Diaz	92	58	77.4	2.95	
Leon de Aldamas	91	50	71.4	1.13	
Topolobampo *1	90	71	80.2	0.14	
New Brunswick.					
St. John	65	32	49.0	10.26	
West Indies.					
Grand Turk Island	......	......	......	7.14	

Late reports for April, 1897.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alaska.					
Coal Harbor	48	16	36.4	3.85	5.5
Arizona.					
Buttes	......	......	......	0.00	
California.					
Placerville	82	28	54.4	2.23	
San Miguel Island	88	43	56.8	0.04	
Idaho.					
Moscow	78f	32f	50.2f	0.40	
Salubria	87	26	50.2	0.92	1.5
Illinois.					
Evanston *10	74	22	45.4	......	
Kansas.					
Delphos *1	85	31	54.7	1.90	
Kentucky.					
Louisia *a*	......	......	......	5.34	
Michigan.					
Mount Clemens	......	......	......	1.63	T.
St. Ignace	66	19	38.4	......	......
Minnesota.					
Lutsen	63	8	35.8	1.18	
Missouri.					
Appleton City	84	28	54.0	5.70	
Bethany	81	38	61.3	2.42	
Nevada.					
Los Vegas	80	30	58.6	0.03	
New Jersey.					
Perth Amboy	86	24	50.8	3.28	0.5
Oregon.					
Umatilla	......	......	......	0.26	
Washington.					
Mayfield	......	......	......	3.59	
Mexico.					
Topolobampo *1	86	62	74.2	T.	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

† Weather Bureau instruments.

‡ Record furnished by the Arrowhead Reservoir Company, in the San Bernardino Mountains, San Bernardino County, Cal., at elevations varying from 5,150 to 5,350 feet.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

1 Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
2 Mean of 8 a. m. + 8 p. m. ÷ 2.
3 Mean of 7 a. m. + 7 p. m. ÷ 2.
4 Mean of 6 a. m. + 6 p. m. ÷ 2.
5 Mean of 7 a. m. + 2 p. m. ÷ 2.
6 Mean of readings at various hours reduced to true daily mean by special tables.
7 Mean from hourly readings of thermograph.
8 Mean of 7 a. m. + 2 p. m. + 9 p. m. ÷ 3.
9 Mean of sunrise and noon.
10 Mean of sunrise, noon, sunset, and midnight.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "n" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

Minnesota, Collegeville, April, 1897, make precipitation read 1.25 instead of 2.02.

Washington, Ashford, February, 1897, make precipitation read 8.24 instead of 7.91.

Page 137, line 9 from bottom, for "incidently," read "incidentally."

Page 148, bottom line, for *N R R*, read *N R R'*.

Page 162, line 20 from bottom, for $S_0\ K_0$, read $S_0\ K_1$.

Page 163, line 17, for William Wilson, read Alexander Wilson.

TABLE III.—*Data from Canadian stations for the month of May, 1897.*

Stations.	Pressure. Mean not reduced.	Pressure. Mean reduced.	Pressure. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Precipitation. Total.	Precipitation. Departure from normal.	Prevailing direction of wind.	Total depth of snow.
	Inches.	Inches.	Inches.	°	°	Inches	Inches.		
St. Johns, N. F	29.86	30.01	+ .06	47.8	+ 3.4	2.88	....	s.	T.
Sydney, C. B. I	29.98	30.04	+ .07	47.2	+ 2.7	4.76	+ 0.43	sw.	2.0
Grindstone, G. St. L.	29.89	29.92	....	41.2	....	2.61	....	sw.	
Halifax, N. S	29.92	30.05	+ .08	48.6	+ 1.6	4.63	— 0.09	s.	0.2
Grand Manan, N. B.	29.92	29.97	— .01	46.2	....	7.76	+ 4.23	s.	
Yarmouth, N. S.	29.91	29.99	+ .01	49.5	+ 2.5	6.50	+ 2.47	s.	T.
St. Andrews, N. B.	....	....	....	....	....	....	....	......	
Charlottet'n, P. E. I.	29.95	29.99	+ .03	48.2	+ 1.6	3.25	+ 0.10	s.	
Chatham, N. B	29.95	29.97	+ .02	49.0	+ 3.0	4.78	+ 0.88	e.	0.3
Father Point, Que.	29.93	29.96	+ .02	42.8	— 0.7	3.14	+ 0.71	e.	
Quebec, Que	29.62	29.95	.00	48.1	— 1.4	5.14	+ 2.02	ne.	
Montreal, Que	29.72	29.93	.00	52.6	— 1.4	3.74	+ 0.66	sw.	
Rockliffe, Ont	29.41	29.92	— .02	50.8	+ 1.3	3.49	+ 0.89	nw.	
Kingston, Ont	29.62	29.94	— .02	52.1	— 0.9	2.83	+ 0.08	sw.	
Toronto, Ont	29.58	29.96	— .02	51.6	— 1.4	3.02	+ 0.37	sw.	
White River, Ont	28.65	30 01	+ .04	45.6	+ 2.0	1.27	— 0.24	n.	1.2
Port Stanley, Ont	29.34	29.98	.00	51.0	....	2.75	— 0.09	n.	
Saugeen, Ont	29.24	29.96	.00	48.8	— 1.2	3.75	+ 1.18	n.	
Parry Sound, Ont.	29.24	29.94	— .02	49.8	— 0.7	3.86	+ 0.54	n.	
Port Arthur, Ont	29.28	29.98	+ .06	45.8	— 0.7	2.06	— 0.12	ne.	T.
Winnipeg, Man	29.12	29.94	+ .01	52.3	+ 2.3	1.59	— 1.23	n.	0.4
Minnedosa, Man	28.18	29.96	+ .07	51.4	+ 2.4	1.02	— 0.62	n.	0.1
Qu'Appelle, Assin.	27.71	29.93	+ .05	54.2	+ 4.2	0.25	— 1.27	nw.	
Medicine Hat, Assin	....	....	....	....	....	....	....	......	
Swift Curr't, Assin.	27.38	29.92	+ .03	56.9	+ 5.9	0.26	— 1.23	s.	
Calgary, Alberta	26.48	29.95	+ .07	55.8	+ 4.8	0.18	— 1.31	w.	
Prince Albert, Sask.	28.34	29.83	....	53.2	....	0.98	....	e.	
Edmonton, Alberta.	27.62	29.92	+ .05	55.4	+ 5.8	0.33	— 1.27	nw.	
Battleford, Sask	28.22	29.93	....	56.9	....	0.24	....	nw.	
Kamloops, B. C.	28.74	29.95	....	61.5	....	0.39	....	e.	
Hamilton, Bermuda	29.98	30.14	+ .08	70.0	....	5.06	....	se.	
Banff, Alberta	25.34	29.93	....	50.0	....	1.37	....	sw.	0.1
Esquimalt, B. C.	30.02	30.05	....	52.0	....	0.62	....	sw.	
Ottawa, Ont	29.60	29.96	....	53.0	....	3.31	....	w.	
Sable Island, N. S.	....	....	....	....	....	....	....	......	

TABLE IV.—*Meteorological observations at Honolulu, Republic of Hawaii, by Curtis J. Lyons, Meteorologist to the Government Survey.*

Pressure is corrected for temperature and reduced to sea level, but the gravity correction, —0.06, is still to be applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 10. Two directions of wind, connected by a dash, indicate change from one to the other; also same for force.

The rainfall for twenty-four hours is given as measured at 6 a. m. on the respective dates.

April, 1897.	Pressure at sea level. 9 a. m.	Pressure at sea level. 3 p. m.	Pressure at sea level. 9 p. m.	Temperature. 6 a. m.	Temperature. 2 p. m.	Temperature. 9 p. m.	Temperature. Maximum.	Temperature. Minimum.	Relative humidity. 6 a. m.	Relative humidity. 2 p. m.	Relative humidity. 9 p. m.	Wind. Direction.	Wind. Force.	Cloudiness.	Rain measured at 6 a. m.
	Ins.	Ins.	Ins.	°	°	°	°	°	%	%	%				Ins.
1	30.17	30.07	30.12	69	78	71	79	68	74	57	68	n-ne.	4	7	0.01
2	30.16	30.07	30.13	69	79	72	80	68	65	51	67	ene.	4	3	T.
3	30.14	30.05	30.10	71	78	72	79	70	68	55	70	e-ne.	3-5	2	T.
4	30.14	30.05	30.13	70	80	69	81	69	68	52	81	ne.	3	3	0.00
5	30.15	30.08	30.15	70	80	71	80	68	72	50	70	ne.	3	2	0.12
6	30.15	30.06	30.11	70	80	70	80	68	68	49	85	ne.	3	2	0.00
7	30.14	30.05	30.12	70	80	70	81	68	72	40	68	ne.	3	1	0.04
8	30.20	30.11	30.18	69	79	72	79	67	74	51	66	nne.	3	8-3	0.14
9	30.22	30.14	30.27	67	73	69	76	66	90	63	57	nne.	4-5	9-4	0.42
10	30.13	30.05	30.10	68	77	68	77	67	60	49	65	nne.	4	3	0.06
11	30.12	30.01	30.05	64	78	68	79	64	85	49	73	nne.	3-1	2	0.00
12	30.08	30.02	30.06	67	77	70	78	66	66	50	68	n.	3-0	4	0.00
13	30.10	30.02	30.09	70	78	71	80	68	70	51	67	ene.	4	3	0.00
14	30.15	30.08	30.15	68	80	70	81	65	65	51	72	nne.	4-0	2	T.
15	30.16	30.08	30.15	71	79	72	81	69	68	58	71	ene.	4	7-2	0.00
16	30.19	30.10	30.18	68	80	71	80	66	81	54	72	ne.	3	3	0.00
17	30.17	30.09	30.19	70	78	72	81	67	74	53	67	ne.	4	4	0.00
18	30.18	30.09	30.17	71	79	70	81	70	68	51	71	ene.	4	8-3	0.01
19	30.18	30.15	30.15	72	81	72	82	69	64	49	68	ne.	4	4	0.00
20	30.22	30.12	30.16	72	80	72	80	70	64	51	67	ne.	4-5	8	0.00
21	30.21	30.12	30.15	71	81	72	81	71	68	52	73	ene.	4-5	6-3	0.01
22	30.17	30.10	30.12	71	80	72	81	70	70	54	71	ne.	4	3	0.01
23	30.14	30.07	30.11	71	80	72	81	69	74	51	69	ne.	4-3	2	0.09
24	30.15	30.08	30.15	69	80	71	80	68	79	59	70	ne.	4-3	3-9	0.04
25	30.21	30.12	30.20	69	77	71	78	67	72	59	68	ne.	4	7-3	0.18
26	30.24	30.17	30.22	71	79	70	80	66	67	55	83	ne.	3	4	0.14
27	30.22	30.14	30.20	70	80	71	80	68	67	51	72	ne.	3-0	3	0.14
28	30.21	30.13	30.19	70	80	72	80	69	68	51	69	ne.	3-1	3	T.
29	30.21	30.14	30.17	70	79	71	80	69	73	49	72	ne.	4-1	5	T.
30	30.21	30.13	30.21	70	80	72	80	68	74	56	73	ene.	4	5	0.04
31	......	......	......	....	....	....	....	....	....	....	....	....	.....	......	....
	30.17	30.09	30.15	70.0	79.0	70.9	79.9	68.0	70.9	52.4	70.4	ne.	3.6	3.8	1.45

Mean temperature: 6+2+9÷3 is 73.3°; the normal is 73.0°; extreme temperatures, 82° and 64°.

TABLE V.—*Mean temperature for each hour of seventy-fifth meridian time, May, 1897.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Bismarck, N Dak	52.5	51.1	49.4	47.9	46.6	45.4	44.9	47.3	50.8	54.9	58.4	61.4	63.8	65.4	67.2	68.4	68.9	68.7	67.7	66.1	62.7	58.5	56.0	54.0	57.4
Boston, Mass	53.4	52.9	52.6	52.3	52.2	52.3	53.6	55.5	57.1	58.5	59.3	60.0	60.1	61.2	62.3	61.7	61.6	61.3	60.0	58.1	57.0	56.0	54.7	54.1	57.0
Buffalo N Y	51.1	51.0	50.8	50.3	49.7	50.1	51.2	52.8	54.2	55.6	56.9	57.5	57.1	57.0	57.0	56.6	55.9	55.5	54.3	54.3	52.7	52.3	51.5	50.9	53.6
Chicago, Ill	52.4	51.6	51.2	50.5	49.7	49.2	49.8	51.7	52.9	54.8	56.8	57.3	57.7	58.4	59.4	59.6	58.8	58.9	57.8	57.1	56.5	55.3	54.3	53.5	54.8
Cincinnati, Ohio	55.9	54.8	54.0	53.2	52.7	52.1	52.6	54.3	56.6	59.2	61.4	62.9	63.5	64.8	65.5	65.9	65.7	65.8	64.9	64.0	62.4	60.7	59.1	57.6	59.6
Cleveland, Ohio	52.4	52.0	51.3	50.4	49.7	49.1	50.3	51.2	53.7	55.1	56.2	56.4	57.2	57.1	57.5	57.0	57.7	58.2	58.0	57.4	56.4	55.6	54.5	53.6	54.5
Detroit, Mich	51.1	50.3	49.7	49.3	48.9	48.9	49.8	51.5	53.7	56.0	57.6	58.8	59.8	60.5	61.2	61.1	60.9	59.6	58.3	56.6	55.2	54.4	53.1	52.0	54.9
Dodge City, Kans	58.1	57.3	56.8	55.9	55.2	54.5	54.0	55.3	58.1	62.2	65.5	68.1	70.1	71.7	73.0	74.0	74.0	73.6	72.3	69.4	65.9	62.8	61.2	60.0	63.7
Eastport, Me	44.0	43.8	43.2	42.8	42.7	43.0	43.5	44.8	46.1	47.0	48.3	48.9	49.7	49.6	49.6	49.2	48.5	47.9	46.8	46.2	45.5	44.9	44.9	44.5	46.1
Galveston, Tex	73.3	72.9	72.6	72.5	72.1	71.6	71.4	72.3	72.7	73.9	75.0	75.9	76.5	77.2	77.9	78.2	78.2	77.7	76.6	75.7	75.2	74.3	74.0	73.8	74.6
Havre, Mont	56.7	55.3	53.2	51.6	50.3	48.4	47.3	48.6	53.3	57.3	62.2	65.3	68.0	69.7	71.3	72.5	73.0	72.6	71.8	71.3	69.2	64.9	61.5	58.6	61.4
Kansas City, Mo	61.2	60.0	59.0	57.8	56.9	55.9	55.8	56.4	58.9	61.6	64.4	67.2	69.0	70.8	72.0	72.7	73.2	72.9	71.6	69.9	67.9	66.2	64.6	62.9	64.5
Key West, Fla	76.0	75.9	75.7	75.5	75.4	75.5	76.7	77.5	78.5	79.2	80.0	80.4	80.7	80.8	80.9	80.5	80.1	78.9	77.5	77.4	76.9	76.6	76.4	76.2	77.9
Memphis, Tenn	65.5	64.9	63.6	62.6	61.8	60.5	59.6	62.2	64.0	66.5	68.7	70.9	72.4	73.9	75.2	76.1	76.4	76.0	75.1	73.5	71.5	70.0	68.7	67.1	68.6
New Orleans, La	69.5	68.7	68.3	67.6	67.5	67.1	66.9	68.9	71.3	73.8	75.7	77.3	79.0	79.7	79.7	80.8	80.5	79.5	77.9	76.0	74.1	72.6	71.5	70.5	73.5
New York, N. Y	55.2	54.9	54.4	54.1	53.4	53.6	54.5	55.8	57.6	59.5	60.8	62.4	63.3	64.5	64.7	63.8	62.8	61.2	59.5	58.9	57.7	57.3	56.4	55.8	58.4
Philadelphia, Pa	57.3	56.5	55.9	55.7	55.2	55.9	57.7	60.0	62.2	64.0	65.6	67.2	68.8	70.2	70.3	70.1	69.4	67.9	65.5	63.7	61.4	60.1	59.1	58.2	62.4
Pittsburg, Pa	54.7	53.4	52.3	51.7	50.9	50.7	51.7	54.3	56.8	59.6	61.4	63.0	64.3	64.9	65.0	65.2	65.0	64.3	63.0	61.3	59.4	58.0	56.6	55.5	58.5
Portland, Oreg	60.5	58.7	57.0	55.8	54.6	53.7	52.4	52.0	51.9	53.2	55.1	57.2	59.8	61.1	64.0	65.6	67.7	68.8	69.7	69.2	69.0	67.2	64.1	62.5	60.4
St. Louis, Mo	60.7	59.6	58.5	57.7	56.8	55.7	55.5	57.9	59.2	61.5	63.7	66.4	68.2	69.0	70.1	70.5	70.4	70.5	69.7	68.0	67.0	65.1	63.5	62.4	63.6
St. Paul, Minn	53.1	51.7	50.4	49.4	48.1	47.2	47.1	48.7	51.7	54.6	57.2	59.2	61.5	62.9	64.3	65.4	66.1	66.4	65.5	63.7	61.4	59.4	56.9	54.7	56.9
Salt Lake City, Utah	61.0	59.4	57.3	56.8	55.8	55.4	54.8	55.7	57.8	61.7	64.9	67.1	69.4	70.9	70.7	71.0	71.7	71.7	71.5	71.4	70.2	67.2	64.5	62.7	64.1
San Diego, Cal	59.5	59.3	58.9	58.9	58.8	58.5	58.1	57.9	57.9	58.6	59.6	60.9	61.9	62.6	63.5	63.6	63.7	63.2	62.8	62.3	61.5	60.7	60.2	60.0	60.5
San Francisco, Cal	54.4	53.9	53.7	53.5	53.2	53.2	53.3	53.2	52.8	54.1	55.4	56.8	59.1	60.4	61.3	61.4	61.4	60.5	59.3	58.3	56.9	55.6	54.9	54.5	56.3
Savannah, Ga	67.3	66.5	65.7	64.9	64.3	63.7	65.1	68.7	71.6	74.6	77.4	79.6	80.2	80.5	80.2	79.9	78.5	76.5	74.3	72.3	71.2	70.4	69.4	68.7	72.1
Washington, D. C	57.3	56.5	56.0	55.2	54.4	54.7	56.8	59.6	62.4	64.5	66.5	67.6	68.6	69.3	69.7	70.0	69.6	67.9	66.0	64.1	62.0	60.6	59.8	58.2	62.4

TABLE VI.—*Mean pressure for each hour of seventy-fifth meridian time, May, 1897.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Bismarck, N. Dak	28.231	.238	.241	.245	.251	.259	.267	.272	.276	.277	.272	.264	.251	.237	.225	.213	.201	.192	.187	.189	.197	.207	.216	.223	.235
Boston, Mass	29.818	.816	.814	.816	.826	.838	.847	.848	.843	.839	.831	.819	.807	.799	.789	.786	.784	.789	.795	.800	.809	.813	.814	.8'3	.815
Buffalo, N. Y	29.129	.123	.120	.121	.127	.138	.143	.148	.150	.149	.144	.139	.133	.131	.126	.124	.124	.123	.124	.126	.136	.140	.140	.139	.133
Chicago, Ill	29.127	.121	.120	.123	.129	.139	.149	.159	.163	.161	.164	.161	.153	.147	.139	.131	.125	.121	.119	.121	.129	.135	.134	.132	.138
Cincinnati, Ohio	29.354	.350	.344	.345	.350	.360	.372	.383	.386	.387	.387	.384	.374	.368	.360	.354	.351	.349	.351	.355	.359	.366	.368	.365	.363
Cleveland, Ohio	29.163	.159	.155	.155	.163	.169	.168	.182	.190	.190	.190	.187	.180	.176	.167	.166	.165	.161	.163	.165	.172	.177	.176	.175	.171
Detroit, Mich	29.196	.193	.187	.185	.189	.194	.201	.205	.207	.206	.205	.199	.195	.192	.187	.184	.184	.185	.188	.194	.204	.207	.207	.206	.196
Dodge City, Kans	27.448	.450	.445	.441	.441	.443	.449	.459	.463	.462	.462	.457	.453	.440	.428	.416	.398	.390	.389	.388	.400	.414	.429	.433	.433
Eastport, Me	29.878	.877	.876	.882	.890	.900	.907	.914	.917	.915	.910	.905	.898	.889	.880	.875	.871	.871	.876	.880	.880	.876	.871	.865	.888
Galveston, Tex	30.027	.023	.015	.014	.016	.019	.029	.036	.044	.050	.058	.064	.052	.044	.032	.017	.002	.994	.990	.993	.005	.016	.025	.027	.025
Havre, Mont	27.322	.324	.325	.327	.332	.335	.342	.347	.351	.354	.349	.344	.336	.326	.313	.303	.295	.287	.284	.279	.284	.295	.308	.315	.320
Kansas City, Mo	29.047	.048	.047	.049	.054	.061	.071	.079	.091	.092	.089	.083	.070	.053	.038	.024	.011	.003	.000	.004	.015	.026	.035	.039	.047
Key West, Fla	30.005	.996	.988	.986	.989	.996	.010	.019	.023	.028	.026	.021	.012	.999	.984	.975	.971	.976	.987	.001	.011	.019	.022	.018	.003
Memphis, Tenn	29.625	.625	.622	.625	.630	.639	.655	.666	.678	.684	.685	.681	.668	.655	.639	.624	.610	.603	.596	.600	.609	.618	.625	.628	.637
New Orleans, La	29.991	.985	.986	.988	.993	.005	.018	.026	.034	.037	.034	.027	.014	.002	.983	.968	.960	.957	.958	.965	.973	.985	.992	.993	.995
New York, N. Y	29.629	.623	.621	.621	.627	.635	.645	.651	.651	.648	.640	.630	.617	.607	.598	.593	.596	.602	.608	.613	.625	.630	.635	.633	.624
Philadelphia, Pa	29.844	.840	.842	.843	.848	.854	.863	.872	.876	.875	.870	.858	.843	.828	.818	.815	.812	.813	.819	.828	.838	.843	.845	.845	.843
Pittsburg, Pa	29.107	.104	.102	.099	.101	.104	.115	.121	.123	.122	.119	.115	.105	.099	.090	.087	.086	.088	.093	.102	.110	.115	.115	.115	.106
Portland, Oreg	29.875	.880	.887	.891	.894	.897	.901	.908	.915	.920	.923	.924	.923	.919	.906	.896	.883	.868	.856	.846	.842	.846	.854	.866	.888
St. Louis, Mo	29.451	.448	.448	.450	.456	.468	.481	.492	.499	.500	.493	.487	.475	.466	.452	.439	.430	.423	.420	.420	.427	.440	.449	.451	.457
St. Paul, Minn	29.106	.108	.105	.107	.105	.113	.124	.130	.134	.131	.123	.115	.103	.093	.086	.076	.069	.062	.060	.062	.071	.080	.095	.101	.098
Salt Lake City, Utah	25.641	.643	.643	.642	.643	.643	.647	.653	.662	.665	.663	.661	.656	.645	.635	.622	.609	.598	.592	.593	.598	.607	.620	.628	.634
San Diego, Cal	29.885	.885	.879	.872	.863	.858	.855	.856	.868	.875	.881	.884	.887	.885	.882	.878	.868	.860	.854	.850	.851	.859	.869	.877	.870
San Francisco, Cal	29.850	.849	.846	.841	.836	.834	.834	.835	.846	.854	.860	.862	.863	.861	.855	.847	.836	.824	.819	.814	.815	.821	.836	.845	.841
Savannah, Ga	29.923	.920	.918	.920	.928	.941	.956	.966	.971	.970	.965	.953	.935	.919	.904	.894	.889	.890	.896	.907	.919	.929	.934	.936	928
Washington, D. C	29.872	.867	.864	.868	.872	.882	.887	.891	.891	.889	.882	.870	.858	.847	.839	.832	.827	.834	.844	.850	.863	.869	.875	.878	.865

TABLE VII.—*Average wind movement for each hour of seventy-fifth meridian time, May, 1897.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Abilene, Tex	7.4	7.9	7.4	7.4	7.5	7.1	7.3	6.6	8.5	10.0	10.4	10.7	10.6	10.5	10.9	10.5	11.0	12.4	12.7	11.9	9.8	8.3	7.7	7.5	9.3
Albany, N. Y	5.1	5.7	5.6	5.3	5.5	5.8	6.5	8.3	10.3	9.9	10.4	10.5	11.2	12.3	12.3	12.4	12.1	11.3	9.5	8.9	7.6	7.0	6.7	5.8	8.6
Alpena, Mich	6.8	7.0	6.9	6.4	6.7	7.5	7.7	8.7	9.0	9.0	10.5	11.5	12.4	12.5	12.8	13.1	12.7	11.2	10.1	8.6	7.7	6.9	7.2	6.7	9.2
Amarillo, Tex	14.3	13.0	12.1	13.7	13.3	12.5	12.2	11.6	12.9	14.9	15.9	16.7	15.9	15.8	16.1	15.7	16.0	17.4	17.5	17.8	16.2	14.2	13.8	14.4	14.8
Atlanta, Ga	8.6	8.9	8.6	8.6	8.9	8.4	7.9	8.3	8.5	8.8	9.8	10.0	10.9	10.9	11.3	11.6	11.4	10.9	10.0	8.2	8.2	8.4	8.4	9.0	9.4
Atlantic City, N. J	10.5	10.3	10.4	10.6	10.1	10.1	11.7	11.9	12.8	12.8	12.9	12.9	13.1	13.1	13.3	12.9	12.8	11.6	10.3	9.6	9.6	9.9	10.3	10.6	11.4
Augusta, Ga	4.9	4.9	4.9	4.6	4.5	4.2	4.7	5.9	7.3	7.5	8.1	8.4	8.8	9.2	9.6	10.0	9.9	8.6	7.3	5.8	5.4	4.5	4.5	5.2	6.6
Baker City, Oreg	5.4	5.6	6.2	6.2	6.8	6.5	6.6	7.2	6.2	6.3	5.1	5.3	6.2	7.4	7.9	8.1	8.5	8.1	8.4	9.5	8.9	6.8	5.3	6.0	6.8
Baltimore, Md	3.8	3.9	3.7	3.6	3.9	4.0	4.5	5.3	6.5	7.1	7.5	7.9	8.3	8.3	8.2	7.5	7.2	6.7	5.6	4.4	4.5	4.2	4.2	4.5	5.6
Bismarck, N. Dak	8.3	8.0	7.7	7.7	7.2	6.6	7.4	8.7	10.6	11.6	13.6	14.1	15.4	15.6	15.8	16.0	15.4	14.6	14.8	13.9	10.7	8.7	7.9	8.4	11.2
Block Island, R. I	12.4	12.2	12.6	12.6	12.8	12.9	13.5	14.8	15.6	15.8	15.6	15.8	16.5	17.0	17.3	16.5	17.4	17.1	16.3	15.5	14.9	14.2	13.7	12.8	14.8
Boston, Mass	8.9	8.8	8.9	9.3	9.1	8.9	10.2	10.3	11.3	11.8	11.9	12.7	13.2	13.1	12.8	12.7	12.2	11.7	10.7	10.2	10.3	10.2	10.0	9.1	10.8
Buffalo, N. Y	12.3	12.2	11.9	11.9	13.0	12.4	11.9	13.5	12.9	12.9	13.9	13.8	14.9	15.2	14.9	15.5	15.8	15.2	14.6	14.5	13.9	14.1	12.7	12.4	13.6
Cairo, Ill	5.8	6.4	6.5	6.4	5.7	5.4	4.8	5.8	7.0	7.2	7.6	8.7	8.7	9.2	9.3	9.0	8.8	8.8	7.5	6.3	6.2	5.7	5.4	5.1	7.0
Cape Henry, Va	12.7	13.2	13.1	13.0	13.5	13.8	13.8	14.4	14.1	14.5	15.4	15.2	14.6	13.4	12.5	12.2	12.5	13.4	11.6	11.4	11.5	11.0	11.1	11.8	13.1
Carson City, Nev	7.7	7.3	6.2	5.8	5.5	4.8	4.5	4.1	3.1	3.5	4.1	5.2	6.6	7.2	7.5	8.6	10.8	12.2	12.7	12.8	13.9	11.5	8.7	7.5	7.6
Charleston, S. C	10.4	9.6	9.6	9.5	9.6	9.7	10.3	11.6	12.7	12.0	12.5	12.7	13.6	14.5	14.9	14.4	14.1	13.2	11.8	9.9	9.9	10.3	9.9	9.3	11.5
Charlotte, N. C	6.3	6.0	5.6	5.3	4.9	5.4	5.8	6.4	6.9	7.3	7.3	7.3	7.5	8.5	8.2	8.7	7.6	7.6	5.7	5.6	6.3	6.5	6.3	6.0	6.6
Chattanooga, Tenn	4.1	4.6	4.4	4.0	3.9	4.6	4.4	5.1	6.8	8.1	8.3	8.9	9.5	9.9	10.4	10.8	10.2	10.0	9.0	7.4	6.8	5.9	5.1	4.4	6.9
Cheyenne, Wyo	6.8	6.3	6.1	6.7	6.6	7.0	7.4	7.0	7.5	8.2	9.2	10.1	10.6	10.9	11.2	12.0	11.8	11.3	12.1	11.1	9.6	7.7	7.9	7.5	8.9
Chicago, Ill	15.4	16.1	16.3	15.7	16.7	16.9	16.7	16.3	17.3	17.5	18.0	18.9	18.8	18.0	18.5	17.1	16.3	15.1	14.6	14.5	14.5	14.4	13.9	14.6	16.3
Cincinnati, Ohio	4.4	4.8	4.6	4.4	4.3	4.4	5.2	6.4	7.4	8.6	9.4	9.8	10.1	10.0	10.4	10.2	10.2	8.9	7.6	6.4	5.6	5.5	5.5	4.6	7.0
Cleveland, Ohio	11.9	11.9	11.6	12.4	12.7	12.3	11.6	11.7	11.8	12.5	13.5	13.8	14.2	13.7	14.0	13.6	12.9	11.5	11.4	10.5	10.8	10.9	11.2	11.6	12.3
Columbia, Mo	6.0	6.3	5.9	5.9	5.5	5.8	6.0	5.7	6.6	7.9	8.7	8.8	8.8	8.8	8.9	9.5	8.4	8.4	7.7	6.6	6.0	6.2	6.3	6.4	7.1
Columbus, Ohio	4.7	4.0	3.9	4.3	4.4	4.5	4.7	5.1	6.2	7.6	8.2	8.5	9.3	9.3	9.3	8.8	8.9	8.2	7.1	5.9	5.4	5.5	5.1	5.0	6.4
Concordia, Kans	5.7	5.9	5.5	5.3	4.9	5.1	4.8	5.6	6.4	8.3	9.5	9.7	10.2	10.0	10.1	10.0	9.4	8.7	8.9	7.9	6.5	5.8	5.5	5.6	7.3
Corpus Christi, Tex	12.1	11.0	9.9	9.7	8.9	7.9	8.9	8.7	9.9	10.3	11.5	13.5	14.8	15.6	15.9	16.3	16.4	16.5	16.6	15.8	15.1	15.1	14.4	13.0	12.8
Davenport, Iowa	5.5	5.3	5.3	4.9	5.2	5.6	5.5	6.3	7.6	8.9	9.5	9.8	10.3	10.3	10.5	10.2	10.1	9.3	8.6	6.5	5.1	4.8	4.7	4.9	7.3
Denver, Colo	6.1	6.5	5.9	6.5	6.9	6.4	5.8	5.6	5.0	4.6	5.0	5.7	6.8	7.6	8.3	8.7	10.2	10.8	10.5	10.5	9.3	8.3	8.5	7.1	7.4
Des Moines, Iowa	5.8	6.0	5.8	5.9	5.5	5.3	5.6	6.3	6.9	7.9	9.5	10.2	11.2	11.2	11.2	11.9	11.6	10.8	9.5	7.6	6.5	6.0	6.0	5.7	7.9
Detroit, Mich	6.9	7.2	6.9	7.2	7.3	7.2	7.3	7.9	8.2	8.9	9.7	10.8	11.4	11.5	11.8	11.7	11.2	10.3	9.2	8.0	7.0	6.8	6.8	6.8	8.7
Dodge City, Kans	9.2	8.2	7.7	7.3	7.1	6.4	6.8	6.9	9.0	10.6	12.4	13.0	13.8	13.8	13.9	14.8	14.9	15.2	14.9	13.5	10.1	9.5	9.9	9.7	10.8
Dubuque, Iowa	5.6	6.0	5.6	5.4	5.6	5.9	5.8	6.8	7.9	9.1	9.5	10.1	10.4	10.6	10.7	10.0	9.7	8.4	7.5	6.2	5.7	5.8	5.5	5.7	7.5
Duluth, Minn	7.5	7.8	8.2	8.8	9.7	9.7	10.3	9.8	9.0	9.1	9.5	10.1	10.1	10.3	10.6	10.9	10.7	9.7	8.6	8.0	8.1	7.3	7.1	6.7	9.1
Eastport, Me	9.6	9.6	9.9	9.9	9.8	9.5	9.5	10.3	10.5	10.0	10.4	10.6	10.5	11.1	10.7	10.8	10.5	10.5	9.8	9.6	10.1	10.2	9.9	9.7	10.1
El Paso, Tex	10.9	11.3	10.9	11.2	10.5	9.6	9.4	9.3	9.4	9.5	9.2	9.4	10.3	11.1	11.3	11.8	12.4	13.4	14.1	14.8	13.5	11.4	11.1	10.9	11.1
Erie, Pa	8.3	8.6	9.2	9.4	9.0	8.6	8.6	9.6	10.3	10.8	11.3	11.4	11.6	11.5	10.8	10.7	10.9	10.3	8.6	7.6	8.0	7.9	8.1	7.8	9.5
Eureka, Cal	6.2	5.1	4.4	4.5	4.0	3.9	4.0	3.9	3.4	3.5	4.3	5.7	8.3	9.8	10.7	10.9	12.2	12.2	11.2	11.0	10.7	9.0	7.9	6.7	7.3
Fort Canby, Wash	11.5	10.2	10.1	10.2	10.2	10.3	10.6	9.9	10.5	10.7	11.8	11.4	10.8	10.8	11.1	11.5	12.1	11.8	12.0	13.1	13.2	13.7	12.4	11.6	11.3
Fort Smith, Ark	3.7	4.0	4.0	4.0	4.7	4.3	4.5	4.5	5.2	5.7	6.1	6.6	7.3	6.9	6.9	7.1	7.6	7.5	7.1	5.8	4.8	4.5	4.5	3.7	5.5
Fresno, Cal	8.8	9.3	8.2	6.9	6.5	5.7	5.1	5.1	4.9	5.3	5.8	5.9	5.2	5.4	5.6	5.7	6.1	6.4	6.9	7.4	8.8	9.3	8.7	8.9	6.7
Galveston, Tex	7.4	7.7	7.3	6.9	6.8	6.8	7.0	7.5	8.2	8.8	9.2	9.8	10.2	9.8	10.1	10.1	10.4	10.1	9.6	8.6	8.0	8.2	8.3	8.3	8.5
Grand Haven, Mich	8.9	8.7	8.5	8.6	9.6	9.5	9.7	10.4	11.6	11.5	12.4	12.6	13.2	13.1	12.9	11.7	11.1	10.3	9.5	8.9	8.5	8.1	7.9	8.6	10.2
Greenbay, Wis	8.2	7.7	7.5	7.7	7.3	7.1	7.4	8.2	8.7	9.4	9.8	10.3	9.8	10.4	10.6	11.3	11.4	10.4	9.6	8.7	8.1	7.7	8.2	8.5	8.9
Hannibal, Mo	6.1	6.5	6.2	6.0	6.5	7.1	6.8	6.7	8.0	9.1	9.8	10.1	11.3	11.5	11.3	11.2	10.6	10.1	9.0	7.4	6.7	5.8	5.7	5.9	8.1
Harrisburg, Pa	5.0	5.2	5.6	5.1	5.1	5.9	6.2	7.6	8.0	8.3	9.5	10.2	10.1	10.2	10.3	9.9	10.0	9.7	9.0	8.0	7.0	6.4	5.5	5.3	7.6
Hatteras, N. C	12.4	12.1	13.0	12.9	13.0	13.3	13.8	14.8	16.4	16.5	16.6	16.2	15.9	16.7	16.5	16.3	15.2	14.6	14.2	14.0	13.9	13.8	13.0	12.1	14.5
Havre, Mont	7.5	8.1	8.2	8.3	7.3	7.3	7.7	8.5	9.1	10.4	11.5	11.9	12.4	13.0	13.1	13.5	14.1	14.0	14.5	13.5	11.4	10.7	10.2	8.3	10.6
Helena, Mont	9.3	9.5	9.1	9.1	8.5	8.3	7.9	7.4	5.7	6.1	6.2	6.6	8.8	8.6	9.1	10.0	9.9	10.5	12.0	10.7	8.9	7.3	8.4	9.4	8.6
Huron, S. Dak	10.3	10.1	10.1	10.7	10.9	10.9	11.1	12.1	13.8	15.2	16.1	16.5	16.8	17.1	16.8	17.1	16.6	16.4	15.1	13.2	10.2	9.7	9.9	10.2	13.2
Idaho Falls, Idaho	8.5	7.5	8.2	8.1	7.9	7.1	6.9	6.7	6.7	7.8	9.2	8.9	9.1	9.3	10.3	11.4	12.1	12.3	12.5	12.1	11.6	10.3	8.7	8.5	9.2
Indianapolis, Ind	6.8	6.9	6.6	7.0	7.2	6.7	6.9	7.5	9.0	9.1	10.2	10.1	11.4	10.6	10.7	11.8	10.9	10.6	9.9	9.0	7.3	6.9	7.5	6.4	8.6
Jacksonville, Fla	6.4	6.6	6.8	6.0	5.6	5.3	5.8	7.2	8.5	9.6	10.2	10.3	11.3	11.2	11.5	11.8	11.6	11.0	9.3	7.8	6.2	6.4	6.5	5.6	8.3
Jupiter, Fla	10.1	10.0	9.6	8.9	8.4	7.9	7.9	8.8	10.6	11.4	12.6	13.2	13.7	14.3	14.0	13.7	13.5	12.3	11.2	11.3	11.1	11.5	11.7	10.6	11.2
Kansas City, Mo	6.1	5.9	5.8	5.9	5.5	5.6	5.8	6.5	7.0	7.9	8.6	8.7	9.6	9.4	10.0	9.6	9.5	9.7	9.1	7.5	5.3	5.3	6.1	6.0	7.3
Keokuk, Iowa	5.5	5.1	5.5	5.9	5.5	5.5	5.9	6.5	7.4	8.3	8.5	8.8	9.5	9.6	9.5	9.5	9.9	9.4	8.4	7.2	5.6	5.0	5.3	5.7	7.2
Key West, Fla	11.0	10.9	10.7	10.9	11.0	11.0	11.1	11.5	11.5	11.5	11.8	11.3	11.5	11.8	11.7	12.6	12.6	12.2	12.1	12.2	12.0	12.0	11.3	11.1	11.6
Kittyhawk, N. C	12.6	13.1	14.0	15.0	16.1	16.2	16.3	16.5	17.4	18.0	17.8	15.6	17.2	18.8	18.6	19.3	19.5	17.3	16.8	16.7	14.7	14.3	13.9	13.1	16.2
Knoxville, Tenn	3.3	3.1	3.1	3.4	3.4	3.7	3.6	4.5	5.6	6.0	6.2	6.7	7.9	8.1	7.7	7.8	7.6	7.6	6.6	5.5	4.7	3.7	3.6	3.7	5.3
La Crosse, Wis	6.0	6.2	6.4	6.8	6.5	6.4	7.1	8.2	8.4	8.5	9.3	9.6	9.4	9.4	9.1	9.4	9.7	9.1	8.8	7.7	6.7	6.0	6.2	5.5	7.8
Lander, Wyo	3.9	3.9	3.8	3.6	3.4	2.8	3.0	2.7	2.2	3.5	4.3	4.3	4.7	6.0	6.7	8.0	9.6	9.2	8.7	7.9	7.3	7.3	6.4	4.7	5.3
Lexington, Ky	9.9	10.2	10.2	9.7	9.4	9.1	9.1	9.5	9.6	10.1	11.1	11.2	11.6	11.9	12.0	12.6	12.4	11.5	10.0	8.7	8.5	8.4	8.6	8.6	10.2
Little Rock, Ark	3.5	4.0	4.2	4.2	4.6	4.5	4.3	4.5	5.2	6.2	6.9	7.2	7.0	7.5	7.3	7.5	7.5	7.3	6.4	5.4	4.8	4.4	3.9	3.6	5.5
Los Angeles, Cal	2.6	2.4	2.4	2.0	2.2	2..	1.9	1.9	2.1	2.4	2.5	2.8	3.4	4.3	5.7	7.0	8.2	8.5	8.3	8.2	7.5	5.5	4.2	3.5	4.2
Louisville, Ky	5.6	5.6	5.1	5.4	5.4	5.6	6.0	7.0	7.6	8.6	8.6	9.3	9.9	10.7	10.1	10.1	9.6	9.0	7.7	6.9	6.1	5.7	5.8	5.4	7.4
Lynchburg, Va	2.8	3.0	2.6	3.0	2.4	2.4	3.0	3.9	4.7	5.6	5.9	6.8	6.8	6.8	6.5	6.3	6.5	5.9	5.2	3.6	3.5	3.4	3.2	3.5	4.5
Marquette, Mich	9.5	9.8	9.8	9.7	9.6	9.4	9.1	10.2	10.4	11.4	11.3	10.6	11.8	12.1	12.2	11.0	9.7	9.9	9.0	7.9	7.7	8.2	8.3	9.2	9.9
Memphis, Tenn	7.9	8.2	8.2	7.6	7.8	7.9	7.9	7.7	8.0	8.2	8.6	8.9	8.9	8.8	9.0	9.9	10.0	9.6	8.5	7.1	7.0	7.5	7.2	8.0	8.3
Milwaukee, Wis	7.8	8.0	8.3	8.2	8.0	8.3	8.1	8.5	9.4	10.6	11.2	11.6	11.7	11.5	11.3	11.8	10.9	9.9	9.2	8.0	7.8	7.5	7.5	7.2	9.3
Mobile, Ala	5.0	5.4	5.3	5.0	5.1	5.2	4.8	5.2	5.8	6.8	7.6	8.3	10.4	10.9	12.4	13.5	13.1	11.9	9.7	7.6	6.7	6.2	5.7	5.1	7.6
Montgomery, Ala	5.5	5.6	5.1	4.4	4.4	4.1	4.0	4.8	6.1	6.5	6.8	7.9	8.8	8.9	8.6	9.2	8.9	8.3	7.1	5.4	5.4	5.2	5.0	5.4	6.3
Moorhead, Minn	9.1	9.6	9.3	9.5	9.6	9.4	10.0	10.1	11.2	12.1	12.2	12.3	12.3	13.2	14.1	14.3	14.1	13.5	13.2	11.9	10.4	9.2	8.4	8.5	11.1
Nantucket, Mass	10.0	10.1	10.8	10.9	10.8	11.8	12.3	13.5	13.8	14.4	14.4	14.2	13.9	13.8	13.7	13.0	12.5	11.9	11.1	10.5	10.5	10.4	10.3	10.2	12.0
Nashville, Tenn	4.0	4.0	3.4	3.4	3.7	3.8	4.0	4.9	5.7	6.4	7.1	8.3	8.9	9.0	9.0	9.2	9.2	9.1	8.4	7.2	5.7	5.2	4.8	3.9	6.2
New Haven, Conn	6.8	7.0	7.3	7.9	7.7	7.8	9.0	9.9	11.0	11.8	12.4	12.4	13.6	13.8	13.7	13.5	12.4	11.1	9.4	8.8	8.7	8.2	8.0	7.5	10.0
New Orleans, La	7.0	6.7	6.1	6.3	6.0	6.0	6.2	6.6	8.2	8.9	9.0	8.4	8.9	9.8	10.4	9.7	10.0	10.0	9.5	7.9	7.1	6.8	6.6	7.0	7.9
New York, N. Y	12.2	12.7	12.7	11.9	12.9	12.8	12.0	11.8	12.6	13.6	14.2	14.7	15.2	15.4	16.4	16.2	15.4	15.5	15.0	14.5	13.4	13.2	12.9	11.9	13.7
Norfolk, Va	7.8	7.5	7.6	7.4	7.6	7.4	8.5	9.4	10.3	10.7	10.3	10.5	10.8	10.3	9.9	9.6	9.1	9.1	8.4	7.9	7.5	7.2	7.1	7.5	8.7
Northfield, Vt	5.5	5.8	6.3	6.5	6.2	5.5	5.9	7.2	8.4	10.5	11.8	12.7	13.7	13.7	13.7	13.8	12.9	11.1	9.7	7.8	7.3	7.0	6.6	6.4	9.0
North Platte, Nebr	7.3	7.5	7.3	7.3	7.3	6.3	5.8	5.9	7.5	9.6	10.7	11.3	12.9	13.6	13.2	13.5	13.4	12.6	12.5	12.3	10.7	10.2	9.6	8.5	9.9
Oklahoma, Okla	6.9	7.4	7.5	7.6	7.4	6.8	6.6	6.9	8.5	10.5	12.4	13.2	12.4	12.1	12.7	12.4	12.2	11.4	10.4	9.2	7.5	7.2	7.2	7.8	9.3
Omaha, Nebr	6.5	6.3	5.9	6.1	6.0	5.3	5.4	5.8	6.9	7.9	8.4	9.2	10.3	10.7	10.6	10.4	10.5	9.3	9.0	8.5	6.9	6.3	6.7	7.0	7.7
Oswego, N. Y	9.0	9.0	9.0	9.0	9.4	9.8	9.9	10.0	10.4	10.7	11.2	11.3	10.5	10.3	10.2	9.4	9.0	7.9	7.8	8.1	8.3	8.5	8.7	9.0	9.4
Palestine, Tex	3.6	3.8	3.6	3.8	3.9	3.8	3.7	4.6	5.5	6.4	6.9	6.7	6.2	7.1	6.7	6.8	6.2	6.3	5.9	4.2	2.9	3.2	3.5	3.9	5.0
Parkersburg, W. Va	4.1	4.3	3.8	4.2	4.3	4.0	4.3	4.9	5.7	6.1	6.9	7.5	8.6	8.7	9.3	9.5	8.5	8.0	6.7	4.9	4.3	4.8	4.9	4.6	6.0

TABLE VII.—*Average wind movement, etc.*—Continued.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Pensacola, Fla	6.7	6.9	7.0	7.1	7.5	7.3	7.0	7.1	8.9	9.5	9.8	9.6	11.0	12.4	13.2	13.6	14.1	13.5	11.2	9.2	7.9	7.3	7.0	6.7	9.2
Philadelphia, Pa	9.4	9.8	9.5	8.8	8.8	8.9	9.7	11.6	12.3	12.8	13.4	13.4	13.8	14.1	14.6	13.6	13.1	12.0	11.4	11.5	11.5	10.7	9.7	9.6	11.4
Phœnix, Ariz	3.3	3.5	3.4	3.4	3.3	4.2	4.5	5.0	4.9	5.0	4.6	4.7	4.6	4.8	5.3	6.3	6.4	6.5	6.7	5.6	4.2	4.1	3.9	3.2	4.6
Pierre, S. Dak	8.9	7.7	7.0	7.3	7.3	7.6	6.9	7.2	9.0	11.9	13.2	13.9	14.0	13.8	14.3	13.9	13.9	13.8	13.2	12.6	11.1	10.2	9.6	9.2	10.7
Pittsburg, Pa	3.7	3.7	4.5	4.4	4.3	4.5	4.6	4.8	5.8	6.8	7.5	7.6	8.4	8.4	9.1	9.0	8.5	7.2	6.5	6.3	6.0	4.9	4.1	4.1	6.0
Port Angeles, Wash	5.9	5.5	5.9	5.8	6.3	6.2	5.5	5.9	5.0	4.5	6.1	7.0	7.7	8.9	9.4	9.5	10.2	10.6	10.9	10.6	9.8	8.1	6.9	5.8	7.4
Port Huron, Mich	8.5	8.2	8.2	8.6	8.2	8.1	7.6	8.9	9.5	9.9	10.5	10.6	11.5	12.1	13.5	13.6	13.0	11.8	10.2	8.9	8.3	8.4	8.0	8.3	9.8
Portland, Me	5.0	5.1	5.4	5.9	5.6	5.8	7.0	7.2	7.6	7.9	8.1	8.6	8.6	9.3	10.1	10.1	9.6	8.8	7.7	6.7	6.3	5.5	5.6	5.4	7.2
Portland, Oreg	9.7	9.4	8.2	8.6	8.1	6.5	6.3	5.4	5.9	6.8	8.4	8.4	9.2	9.2	8.6	8.9	9.1	9.3	9.1	8.8	8.4	8.4	8.4	9.4	8.3
Pueblo, Colo	5.3	4.4	5.2	5.2	5.2	4.8	4.8	5.0	4.9	5.4	6.7	8.6	8.6	9.1	9.2	10.1	10.8	12.0	11.9	12.0	9.8	8.8	7.4	6.2	7.6
Raleigh, N. C	5.6	5.7	5.7	5.0	5.3	5.5	5.5	6.9	7.7	8.5	8.3	8.1	8.9	8.6	9.1	8.5	7.7	7.3	5.3	5.0	5.0	5.2	5.5	5.7	6.7
Rapid City, S. Dak	6.3	6.5	6.7	6.6	6.5	6.5	6.6	6.0	7.1	9.1	10.6	11.1	11.8	12.7	12.4	11.3	11.8	10.7	10.8	9.8	7.5	5.5	5.6	5.9	8.6
Redbluff, Cal	7.8	7.5	7.1	6.2	6.1	6.1	5.8	5.5	5.7	6.1	7.7	8.3	7.9	8.4	8.2	8.3	8.5	8.6	8.9	9.1	9.0	8.4	7.8	7.1	7.5
Rochester, N. Y	6.0	6.2	6.5	6.3	6.1	6.3	7.1	7.9	8.0	8.1	8.4	8.4	9.1	9.1	9.1	9.1	9.2	8.5	7.4	6.5	6.9	7.1	7.0	6.7	7.5
Roseburg, Oreg	2.7	2.1	2.1	2.4	2.5	2.2	2.0	1.7	2.0	2.4	2.9	3.6	4.0	4.7	4.6	5.5	6.6	7.3	7.6	7.8	7.9	6.6	4.6	3.4	4.1
Sacramento, Cal	11.5	10.8	11.1	11.4	10.7	10.3	10.2	10.4	10.1	9.9	10.2	10.6	10.9	11.1	11.8	12.3	12.1	13.0	13.5	13.1	12.6	11.4	11.1	11.3	11.3
St. Louis, Mo	7.4	6.8	7.4	8.0	7.8	7.7	6.9	7.4	8.9	9.4	9.2	9.4	10.0	10.4	10.6	11.1	10.5	10.2	9.4	8.5	7.9	8.2	7.9	7.7	8.7
St. Paul, Minn	5.9	5.9	5.9	6.0	6.0	6.0	6.1	6.9	6.9	7.9	8.5	9.4	9.6	10.4	10.9	11.5	11.2	9.9	9.8	8.3	6.6	6.0	5.6	5.6	7.8
Salt Lake City, Utah	6.3	5.4	4.9	4.9	4.6	4.1	4.8	4.4	4.6	4.0	5.8	6.9	8.5	8.9	9.4	10.1	10.2	10.0	10.4	9.1	7.0	5.6	6.2	5.7	6.7
San Antonio, Tex	7.4	5.4	5.4	5.2	5.1	5.1	5.4	6.5	6.7	8.8	8.3	7.5	8.3	8.1	8.2	8.6	8.7	9.1	9.7	10.1	9.6	10.1	9.5	8.9	7.7
San Diego, Cal	4.0	3.8	3.4	3.7	3.5	3.6	3.6	3.5	3.2	3.1	3.5	5.3	7.9	8.9	9.7	10.3	10.3	9.7	9.2	8.6	7.5	6.3	5.3	4.4	5.9
Sandusky, Ohio	7.5	7.8	7.8	7.7	7.5	7.3	7.1	7.4	8.5	8.5	9.5	9.7	10.0	9.8	9.6	9.5	8.9	8.7	8.1	7.3	7.1	7.5	7.2	7.5	8.2
San Francisco, Cal	11.9	10.8	10.4	10.4	10.0	8.9	8.4	8.3	7.8	8.3	9.0	9.9	11.2	12.8	15.5	18.2	20.9	21.6	22.0	21.7	20.6	18.4	15.2	12.2	13.5
San Luis Obispo, Cal	3.2	3.3	3.2	3.1	2.8	2.8	3.4	3.5	3.5	3.9	4.5	5.0	5.8	7.0	7.3	8.5	8.5	9.0	8.5	7.8	7.0	5.9	4.5	3.6	5.2
Santa Fe, N. Mex	6.4	6.5	6.4	5.3	4.7	4.0	4.3	3.7	3.8	4.5	5.1	6.4	8.7	9.7	9.7	9.7	9.5	10.2	9.5	8.3	7.0	5.7	6.1	6.6	6.7
Sault Ste Marie, Mich	5.6	6.0	6.3	5.7	5.7	6.3	6.7	7.1	7.8	8.4	9.3	10.9	13.0	12.8	12.6	13.1	13.5	12.0	10.5	9.4	8.3	7.1	6.5	5.9	8.8
Savannah, Ga	6.7	6.9	6.5	6.4	6.4	6.2	6.6	8.1	9.5	9.3	8.9	9.8	10.6	11.4	12.0	11.9	11.8	10.7	9.3	7.6	7.8	7.8	7.8	7.5	8.6
Seattle, Wash	4.0	3.5	3.0	3.0	3.5	3.0	3.0	3.2	3.2	3.7	4.2	4.8	5.7	6.0	7.1	7.3	7.6	7.5	7.5	7.0	7.0	5.9	5.1	4.0	5.0
Shreveport, La	4.1	4.6	4.3	4.2	3.9	3.7	4.4	4.6	5.7	6.6	7.0	6.8	6.6	6.3	6.2	6.0	6.0	5.9	5.2	4.6	3.4	3.5	4.0	4.4	5.1
Sioux City, Iowa	9.9	9.7	9.5	8.7	9.4	9.5	9.2	9.8	10.6	12.3	14.6	15.6	17.3	16.9	16.7	16.6	16.5	16.3	15.5	14.1	12.7	11.9	11.4	10.9	12.7
Spokane, Wash	5.5	5.2	4.7	4.9	5.2	5.0	5.1	5.1	5.0	6.5	7.1	7.6	7.7	7.4	7.5	7.9	8.1	8.3	8.2	8.0	7.1	5.8	4.6	5.0	6.4
Springfield, Ill	6.4	6.9	7.1	7.1	6.8	6.4	6.8	7.6	8.7	10.0	10.7	11.2	10.8	11.1	11.0	11.1	10.7	9.8	8.9	7.1	6.1	6.6	6.6	6.5	8.4
Springfield, Mo	7.9	7.6	7.4	7.5	7.4	7.9	8.2	7.9	8.9	10.0	10.9	10.5	10.1	9.7	9.1	9.4	9.1	9.1	8.4	7.8	7.6	8.1	8.0	8.3	8.6
Tampa, Fla	4.9	4.5	4.2	4.3	4.2	4.3	4.7	5.9	7.8	8.4	8.7	8.7	9.7	10.3	10.4	10.8	11.1	10.2	9.5	7.3	6.2	5.7	5.1	4.4	7.1
Tatoosh Island, Wash	7.5	8.0	9.0	9.5	9.4	10.3	9.8	10.2	10.4	10.9	11.6	12.1	11.4	11.6	10.6	10.9	11.4	10.5	10.1	9.8	9.0	8.5	7.7	7.3	9.9
Toledo, Ohio	7.5	7.6	7.2	7.2	7.7	7.5	7.6	8.5	8.9	9.5	10.1	10.5	11.5	12.1	12.2	12.2	11.5	10.4	9.1	7.5	7.2	7.5	7.1	7.1	9.0
Vicksburg, Miss	5.5	5.3	5.4	5.5	6.0	5.7	5.9	5.5	5.7	5.8	5.5	5.7	7.2	7.5	7.4	7.4	6.9	6.7	5.8	4.8	4.0	4.5	5.1	5.6	5.8
Vineyard Haven, Mass	8.6	8.1	8.1	7.8	7.7	8.1	9.3	10.6	11.4	12.1	12.1	12.6	12.8	12.7	12.7	12.5	11.6	10.7	10.3	9.6	8.6	8.7	8.5	8.7	10.2
Walla Walla, Wash	5.5	6.1	5.2	5.5	5.4	5.6	5.3	5.0	4.7	5.2	5.7	5.9	6.1	6.2	6.3	6.4	5.9	6.5	6.1	6.4	6.6	6.1	5.4	5.4	5.8
Washington, D. C	5.0	4.9	4.8	5.1	5.4	5.7	6.5	8.5	9.6	10.3	11.0	10.9	10.4	10.7	11.0	10.1	8.9	8.3	7.3	5.5	5.3	5.8	5.4	5.4	7.6
Wichita, Kans	5.2	5.3	5.8	5.8	5.4	5.7	6.1	6.6	7.7	8.6	9.0	9.4	9.6	9.9	9.9	9.6	9.2	8.7	8.3	7.4	5.9	5.5	5.8	5.9	7.3
Williston, N. Dak	7.5	7.0	7.0	7.2	6.9	7.6	6.5	6.4	8.4	10.5	11.2	11.4	12.7	13.0	14.1	14.1	13.3	13.6	13.0	13.8	11.0	8.8	8.1	8.6	10.1
Wilmington, N. C	6.4	6.5	7.1	7.1	6.7	6.8	7.3	8.6	10.3	10.7	10.9	10.7	11.1	12.2	12.8	12.8	12.5	11.3	9.3	8.3	8.0	7.4	6.8	6.3	9.1
Woods Hole, Mass	14.4	13.7	13.4	13.6	13.2	13.5	14.8	15.2	15.8	16.4	15.6	16.1	17.2	16.9	17.1	17.3	16.5	16.0	16.2	15.3	14.5	14.0	13.5	13.9	15.2
Yankton, S. Dak	7.6	7.3	7.8	7.8	7.3	7.0	7.0	7.5	9.3	10.9	12.7	12.8	13.0	13.1	13.4	13.1	12.8	12.3	11.7	10.8	9.4	8.2	8.3	7.3	9.9

TABLE VIII.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of May, 1897.*

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
	Hours.	Hours.	Hours.	Hours.	°	Hours.
New England.						
Eastport, Me	16	25	17	12	s. 29 e.	10
Portland, Me	15	20	15	21	s. 50 w.	8
Northfield, Vt	29	15	9	8	n. 4 e.	14
Boston, Mass	18	21	14	24	s. 73 w.	10
Nantucket, Mass	11	29	15	22	s. 21 w.	19
Woods Hole, Mass.*	4	19	6	6	s.	15
Block Island, R. I	14	20	14	33	s. 72 w.	20
New Haven, Conn	22	26	14	13	s. 14 e.	4
Middle Atlantic States.						
Albany, N. Y	20	24	6	19	s. 73 w.	14
Binghamton, N. Y†	10	7	5	13	n. 69 w.	8
New York, N. Y	17	27	11	24	s. 52 w.	16
Harrisburg, Pa	21	14	12	24	n. 60 w.	14
Philadelphia, Pa	21	23	9	22	s. 81 w.	13
Atlantic City, N. J	17	27	9	26	s. 60 w.	20
Baltimore, Md	20	18	14	25	n. 80 w.	11
Washington, D. C	24	23	9	18	n. 84 w.	9
Lynchburg, Va	17	22	11	25	s. 70 w.	15
Norfolk, Va	18	22	19	15	s. 45 e.	5
South Atlantic States.						
Charlotte, N. C	14	22	26	11	s. 62 e.	17
Hatteras, N. C	24	22	12	19	n. 74 w.	7
Kittyhawk, N. C.	22	20	20	19	n. 27 e.	2
Raleigh, N. C	23	20	9	22	n. 77 w.	13
Wilmington, N. C	21	26	12	16	s. 39 w.	6
Charleston, S. C	9	25	16	17	s. 3 w.	16
Augusta, Ga	24	18	12	18	n. 45 w.	8
Savannah, Ga	14	31	11	16	s. 16 w.	18
Jacksonville, Fla	16	27	23	15	s. 36 e.	14
Florida Peninsula.						
Jupiter, Fla	17	20	20	15	s. 59 e.	6
Key West, Fla	19	8	35	9	n. 67 e.	28
Tampa, Fla	23	5	21	23	n. 6 w.	18
Eastern Gulf States.						
Atlanta, Ga	22	16	12	30	n. 72 w.	19
Pensacola, Fla	21	23	13	22	s. 77 w.	9
Mobile, Ala	26	21	4	18	n. 70 w.	15
Montgomery, Ala	23	14	15	24	n. 45 w.	13
Vicksburg, Miss	20	18	21	17	n. 63 e.	4
New Orleans, La	21	24	24	14	s. 73 e.	10
Western Gulf States.						
Shreveport, La	16	22	25	16	s. 56 e.	11
Fort Smith, Ark	15	12	31	14	n. 80 e.	17
Little Rock, Ark	29	13	14	17	n. 11 w.	16
Corpus Christi, Tex	6	28	41	2	s. 61 e.	45
Galveston, Tex	8	34	27	10	s. 33 e.	31
Palestine, Tex	15	30	24	7	s. 48 e.	23
San Antonio, Tex	18	21	36	2	s. 85 e.	34
Ohio Valley and Tennessee.						
Chattanooga, Tenn	28	17	10	21	n. 45 w.	16
Knoxville, Tenn	29	8	15	23	n 36 w.	14
Memphis, Tenn	23	14	19	20	n. 6 w.	9
Nashville, Tenn	31	11	8	28	n. 27 w.	22
Lexington, Ky	24	18	13	23	n. 59 w.	12
Louisville, Ky	17	21	14	25	s. 70 w.	12
Indianapolis, Ind	21	17	9	24	n. 75 w.	16
Cincinnati, Ohio	19	20	17	22	s. 79 w.	5
Columbus, Ohio	16	17	10	32	s. 87 w.	22
Pittsburg, Pa	19	20	7	30	s. 88 w.	23
Parkersburg, W. Va	22	25	9	22	s. 77 w.	13
Lower Lake Region.						
Buffalo, N. Y	10	22	12	33	s. 60 w.	24
Oswego, N. Y	11	24	14	27	s. 45 w.	18
Rochester, N. Y	16	18	11	27	s. 83 w.	16
Erie, Pa	9	20	9	36	s. 68 w.	29
Cleveland, Ohio	20	23	6	25	s. 81 w.	19
Sandusky, Ohio	18	22	9	29	s. 79 w.	20
Toledo, Ohio	13	12	10	38	n. 88 w.	28
Detroit, Mich	16	22	9	34	s. 77 w.	26
Upper Lake Region.						
Alpena, Mich	22	16	18	22	n. 34 w.	7
Grand Haven, Mich	21	20	9	27	n. 87 w.	18
Marquette, Mich	32	11	9	29	n. 44 w.	29
Port Huron, Mich	25	25	8	16	w.	8
Sault Ste. Marie, Mich	25	9	21	25	n. 14 w.	16
Chicago, Ill	25	14	7	24	n. 57 w.	20
Milwaukee, Wis	21	13	17	21	n. 27 w.	10
Upper Lake Region—Cont'd.						
Greenbay, Wis	19	24	12	18	s. 50 w.	8
Duluth, Minn	31	9	25	16	n. 22 e.	24
North Dakota.						
Moorhead, Minn	22	20	23	17	n. 72 e.	6
Bismarck, N. Dak	26	16	18	13	n. 27 e.	11
Williston, N. Dak	26	19	16	12	n. 30 e.	8
Upper Mississippi Valley.						
St. Paul, Minn	26	21	8	25	n. 74 w.	18
La Crosse, Wis. †	10	13	4	8	s. 53 w.	5
Davenport, Iowa	20	18	12	29	n. 83 w.	17
Des Moines, Iowa	29	17	11	20	n. 37 w.	15
Dubuque, Iowa	16	17	8	31	s. 88 w.	23
Keokuk, Iowa	21	23	10	24	s. 82 w.	14
Cairo, Ill	30	15	19	13	n. 22 e.	16
Springfield, Ill	19	26	9	19	s. 55 w.	12
Hannibal, Mo. †	8	14	5	13	s. 53 w.	10
St. Louis, Mo	14	26	14	18	s. 18 w.	13
Missouri Valley.						
Columbia, Mo.*	11	7	11	10	n. 14 e.	4
Kansas City, Mo	28	18	16	13	n. 17 e.	10
Springfield, Mo	19	24	19	15	s. 39 e.	6
Lincoln, Nebr	18	26	20	14	s. 37 e.	10
Omaha, Nebr	21	22	18	12	s. 80 e.	6
Sioux City, Iowa†	10	15	6	5	s. 11 e.	51
Pierre, S. Dak	17	23	24	13	s. 61 e.	12
Huron, S. Dak	19	27	19	14	s. 32 e.	9
Yankton, S. Dak	16	20	17	16	s. 14 e.	4
Northern Slope.						
Havre, Mont	20	15	16	26	n. 63 w.	11
Miles City, Mont	21	18	21	16	n. 59 e.	6
Helena, Mont	13	23	8	36	s. 70 w.	30
Rapid City, S. Dak	21	20	16	23	n 82 w.	7
Cheyenne, Wyo	25	19	9	22	n. 65 w.	14
Lander, Wyo	19	24	17	21	s. 39 w.	6
North Platte, Nebr	13	27	16	19	s. 12 w.	14
Middle Slope.						
Denver, Colo	15	27	14	19	s. 23 w.	13
Pueblo, Colo	28	8	16	23	n. 19 w.	21
Concordia, Kans	14	29	16	11	s. 18 e.	16
Dodge City, Kans	14	31	20	8	s. 35 e.	21
Wichita, Kans	18	23	19	5	s. 70 e.	15
Oklahoma, Okla	15	29	23	7	s. 49 e.	21
Southern Slope.						
Abilene, Tex	13	32	29	6	s. 50 e.	30
Amarillo, Tex	16	32	13	8	s. 17 e.	17
Southern Plateau.						
El Paso, Tex	20	7	30	19	n. 40 e.	17
Santa Fe, N. Mex	14	24	26	16	s. 45 e.	14
Phœnix, Ariz	23	6	27	19	n. 25 e.	19
Yuma, Ariz	13	24	10	16	s. 29 w.	12
Middle Plateau.						
Carson City, Nev	23	12	6	35	n. 69 w.	31
Winnemucca, Nev	26	14	19	19	n.	12
Salt Lake City, Utah	17	22	28	14	s. 70 e.	15
Northern Plateau.						
Baker City, Oreg	27	26	11	12	n. 45 w.	1
Idaho Falls, Idaho	24	32	4	8	s. 27 w.	9
Spokane, Wash	14	28	15	20	s. 20 w.	15
Walla Walla, Wash	20	29	10	9	s. 6 e.	9
North Pacific Coast Region.						
Fort Canby, Wash	27	18	6	16	n. 48 w.	14
Port Angeles, Wash.*	2	0	7	23	n. 83 w.	16
Seattle, Wash	26	19	9	18	n. 52 w.	11
Tatoosh Island, Wash	11	25	13	26	s. 43 w.	19
Portland, Oreg	29	13	5	32	n. 59 w.	31
Roseburg, Oreg	33	5	13	24	n. 22 w.	30
Middle Pacific Coast Region.						
Eureka, Cal	26	13	6	31	n. 28 w.	63
Redbluff, Cal	25	23	23	12	n. 80 e	11
Sacramento, Cal	15	35	1	28	s. 53 w.	34
San Francisco, Cal	2	23	1	49	s. 66 w.	52
South Pacific Coast Region.						
Fresno, Cal	35	5	6	40	n. 48 w.	45
Los Angeles, Cal	9	24	12	30	s. 50 w.	23
San Diego, Cal	25	18	8	28	n. 71 w.	21
San Luis Obispo, Cal	22	11	2	30	n. 52 w.	36

*From observations at 8 p. m. only. †From observations at 8 a. m. only.

TABLE IX.—*Thunderstorms and auroras, May, 1897.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	50	T.										2		3	1	4									1	3						3	1	18	8	T.
		A.																																0	0	A.
Arizona	49	T.		4	1	1									1	1	1													2	9	4	2	26	10	T.
		A.																																0	0	A.
Arkansas	50	T.						1	2	5	6	8	4	2		1									3		1		1	10	3			47	13	T.
		A.																																0	0	A.
California	197	T.		2										4	5	15	4	2				2			7	2		1						44	10	T.
		A.																																0	0	A.
Colorado	71	T.	1	4	3	7	10	3	8	5	3	4	4	2	4	6	5	11	5	9	7	11	7	1		10	6	5	5		4	12	9	171	29	T.
		A.																											1				1	2	2	A.
Connecticut	14	T.										4		9	2	1							10			3	2					10	4	45	9	T.
		A.																			1													1	1	A.
Delaware	4	T.												3	1								3			2							2	11	5	T.
		A.		2																														2	1	A.
Dist. of Columbia	4	T.		1										1	1								1			1								5	5	T.
		A.																																0	0	A.
Florida	38	T.									1		3	12	12	9	11			1					1	4	1				3	1		59	12	T.
		A.																																0	0	A.
Georgia	50	T.	1			1						3		7	5	1	1	1					1							2		2	2	27	12	T.
		A.																																0	0	A.
Idaho	36	T.	3				6	2	1						5	8	9	7	3	1	2	6	5	1		7	7					1	2	76	18	T.
		A.																												1				1	1	A.
Illinois	97	T.		1						9	13		7		3	1	2				1	11		14	4				9	4	1			80	14	T.
		A.								1				1									1	1					1			1		6	6	A.
Indiana	49	T.							1	8	17		6			3	9					14		2	7	2								69	10	T.
		A.										1				1																		2	2	A.
Indian Territory	7	T.					1				2	2		1	1			1						2					1					11	8	T.
		A.																																0	0	A.
Iowa	101	T.								20	6	5			4					1	24	4	3	10			3	9	9	1				99	18	T.
		A.																																0	0	A.
Kansas	73	T.		3			1		4	11	3	10	2	11	4							5	8	7		2	11	6	12			1		101	17	T.
		A.		1				1																										2	2	A.
Kentucky	47	T.	1	1						5	8	1	7		1	5	2								5	2	1		1	3	1	1		45	18	T.
		A.																																0	0	A.
Louisiana	51	T.							3	8	7	7	4	10	10	4	1	1									1				5	8	3	72	14	T.
		A.																																0	0	A.
Maine	13	T.																					1								2		1	4	3	T.
		A.																			1													1	1	A.
Maryland	31	T.	1	1	1	2	1	2			1	2	5	10	5	4						5	12		4	10						3	4	73	18	T.
		A.																	1															1	1	A.
Massachusetts	27	T.										8											9			2	7					2	7	35	6	T.
		A.																													2			2	1	A.
Michigan	96	T.								14	20	1	5	1	2	5	3			3	1	9	1	5	7				1	1				79	16	T.
		A.																				2	3	2										7	3	A.
Minnesota	69	T.								8		1	1	1		1			1	4	9			3			2	2	2					35	12	T.
		A.													1			1	1					1							3	1		8	6	A.
Mississippi	45	T.	1							3	1	8	2	8	1	5									2	2					4	6	1	44	13	T.
		A.																																0	0	A.
Missouri	96	T.		1	1			2	1	15	19	5	10	8	3	1					4	11	9	18	10		11	24	18	10	2			183	21	T.
		A.																																0	0	A.
Montana	40	T.					1	1		1	1					1	2	5	8	2	2	2	1			1	6	1				5	1	36	18	T.
		A.	1	1																		1	3						1		1			8	6	A.
Nebraska	112	T.							8	7	1	7	1	1	1		1		1	5	11	1	14	4			3	7	12	1			2	88	19	T.
		A.																		1											3			4	2	A.
Nevada	39	T.	2	1	1	1		1				1			2	3	4	1	5	4	5	6	5	4	9	5							1	61	19	T.
		A.																																0	0	A.
New Hampshire	23	T.			1					1	2	3								5		5	3				1		1		1			23	10	T.
		A.						2													1			1							1		1	6	5	A.
New Jersey	54	T.	3	1		1						12	1	13	7	1	1		1				20			13	4					12	11	101	15	T.
		A.							1																				1					2	2	A.
New Mexico	42	T.	3	2	5	1	1	1	1			2	2	2			3	3	2	4	5	2		2	4	2	4		5		2	5	2	65	24	T.
		A.																																0	0	A.
New York	93	T.	1		1	1			1	1	5	7	1	9		3						6	4		6	13			1			2	1	63	17	T.
		A.																																0	0	A.
North Carolina	60	T.	14				10	1		2	3	4	11	9	11	6	5	2	5				18	4	11	15	1			3	15	14	8	172	22	T.
		A.																																0	0	A.
North Dakota	39	T.						1	7	2			1			1			4	3	4		4	1	1			1	1	1				32	14	T.
		A.		1									1	2	1							4	1		1						2	1	1	15	10	A.
Ohio	140	T.	1							2	36	6	10	7		11	9	1	2			35	6	1	28	13				2				170	16	T.
		A.																													2	2		4	2	A.
Oklahoma	20	T.		1		2	1		2	2	7	5	1	1	5									4					7	1				39	18	T.
		A.																																0	0	A.
Oregon	60	T.				2	6				1					1	3	5				1			2	2	1				5	1		30	12	T.
		A.																			1	1	1											3	3	A.
Pennsylvania	93	T.		1	1						8	3	4	10	4	10	1					2	10	1	13	14	1					6	5	94	17	T.
		A.																																0	0	A.
Rhode Island	6	T.																					3				2						2	7	3	T.
		A.																																0	0	A.
South Carolina	42	T.	7	1						2		3	3	10	9	5	3	1	1				2	3	8	2				2	5	7	3	77	19	T.
		A.																																0	0	A.
South Dakota	46	T.		1					2			1						3	1	9	5			2			3	2	3				1	33	12	T.
		A.																				1									1	1		3	3	A.
Tennessee	49	T.							1	7	5	9	5	3	3	1						1	5		5	2					1	7		55	14	T.
		A.																																0	0	A.
Texas	91	T.				3	6	7	9	1	3	5	13	12	10	14	3	13	7					5	5	2			4	4	4			130	20	T.
		A.																																0	0	A.
Utah	32	T.	2	5	3	4	1								1	3	3		1	1	7	6	2		2	3	1	1				4		50	18	T.
		A.																																0	0	A.
Vermont	13	T.									1	3								3		3	1			3	1							15	7	T.
		A.															1																	1	1	A.
Virginia	37	T.	6				1				6		10	5	4	1	1	2	1			1	8		4	14					1	4		69	16	T.
		A.																																0	0	A.
Washington	51	T.					13								1			5	2											2	19	1		43	7	T.
		A.																				1	1		1									3	3	A.
West Virginia	37	T.									5	1	3	1				2					1		5	6						2		26	9	T.
		A.																				1												1	1	A.
Wisconsin	58	T.		1						5		3		4	2	1				7	5	2		4			1	1						36	12	T.
		A.																				1	4	1							1		1	8	5	A.
Wyoming	11	T.		3		1		1	1	1					1		2			2	2	3	2	1			2	1				2	2	27	16	T.
		A.																																0	0	A.
Sums	2,644	T.	47	35	18	27	59	23	52	145	191	146	126	180	132	137	89	66	45	64	94	154	179	99	154	162	83	61	94	49	87	126	77	3,001		T.
		A.	1	5	0	0	0	3	1	1	0	1	1	3	2	1	1	1	2	1	4	12	14	6	2	0	0	0	4	1	16	6	4	98		A.

TABLE X.—*Hourly sunshine as deduced from sunshine recorders, May, 1897.*

Stations.	Instrument.	Percentages for each hour of local mean time ending with the respective hour.																Hours of sunshine.			
		A. M.								P. M.								Total.			Personal estimate.
		5	6	7	8	9	10	11	Noon	1	2	3	4	5	6	7	8	Actual.	Possible.	Per cent of possible.	
																		Hours.	*Hours.*		
Albany, N. Y	T.	33	29	32	46	59	63	71	75	73	71	68	57	52	42	24	21	242.1	454.9	53	42
Atlanta, Ga	T.	82	77	78	77	78	76	78	76	71	73	72	67	68	66	67	75	316.6	432.6	73	62
Atlantic City, N. J	P.	67	65	62	63	65	70	65	61	60	67	71	63	60	54	49	58	277.6	443.8	63	50
Baltimore, Md	T.	68	58	61	62	65	70	75	80	66	62	58	46	46	29	27	39	255.4	443.8	58	48
Binghamton, N. Y	T.	42	42	43	49	60	63	66	64	54	46	38	38	31	25	27	33	206.8	451.9	46	38
Bismarck, N. Dak	P.	68	71	71	72	72	77	83	71	67	77	76	76	73	54	58	53	329.5	467.4	71	65
Boston, Mass	T.	13	23	30	35	38	45	53	56	53	49	47	52	49	45	45	22	196.0	451.9	43	35
Buffalo, N. Y. *	T.	32	32	41	54	68	71	75	80	79	74	71	70	54	45	34	33	244.1	412.4	59	42
Charleston, S. C	T.	47	52	57	84	91	93	95	95	94	92	92	82	73	64	61	70	346.3	430.7	80	70
Chattanooga, Tenn	T.	48	48	50	60	65	64	70	65	64	63	59	56	61	38	36	50	248.3	434.2	57	53
Cheyenne, Wyo	P.	43	61	77	82	85	84	77	71	61	65	62	57	52	54	39	29	293.5	449.1	65	43
Chicago, Ill	T.	49	48	50	63	71	75	75	75	77	78	72	62	58	39	33	35	279.1	451.9	62	57
Cincinnati, Ohio	T.	58	53	56	55	67	69	69	70	71	68	69	65	60	58	58	69	281.5	443.8	63	55
Cleveland, Ohio	T.	8	6	7	17	33	50	62	66	67	65	60	51	39	31	24	32	182.3	451.9	40	39
Columbus, Ohio	T.	40	35	35	43	64	76	75	74	75	64	69	63	53	53	50	50	262.4	446.7	59	49
Denver, Colo	P.	75	75	78	91	93	89	91	80	73	66	63	65	53	47	44	42	320.5	446.7	72	43
Des Moines, Iowa	T.	63	71	68	68	76	82	80	86	83	83	76	69	59	55	54	47	323.7	451.9	72	67
Detroit, Mich	T.	33	29	29	50	61	68	71	73	72	75	68	64	58	33	24	22	245.3	451.9	54	42
Dodge City, Kans	P.	22	32	52	65	69	68	73	68	68	73	78	79	73	64	32	36	278.5	441.7	63	58
Dubuque, Iowa	T.	50	52	55	75	87	86	89	89	91	91	78	76	62	50	45	36	326.1	451.9	72	75
Eastport, Me	P.	17	16	15	18	23	28	32	33	35	43	39	36	35	30	23	19	130.7	460.7	28	20
Erie, Pa	T.	28	26	30	40	59	64	66	71	75	76	70	60	56	42	30	28	242.1	451.9	54	47
Eureka, Cal	P.	8	10	30	39	46	58	65	66	75	72	68	64	64	58	39	26	235.8	449.1	53	47
Fresno, Cal	T.	78	77	78	83	90	94	94	95	96	93	94	92	89	82	81	90	387.6	439.0	88	83
Galveston, Tex	P.	......	31	72	75	79	75	78	76	78	79	83	88	81	75	55	......	311.7	421.8	74	68
Harrisburg, Pa	T.	69	58	61	68	75	80	82	80	84	77	73	68	61	53	39	38	304.3	446.7	68	38
Helena, Mont	P.	64	67	75	74	73	70	74	78	72	63	71	71	65	61	60	49	321.2	467.4	69	63
Idaho Falls, Idaho	T.	43	39	40	63	76	85	85	89	87	82	77	71	60	41	23	29	291.9	454.9	64	67
Indianapolis, Ind	T.	64	61	64	68	72	70	69	68	75	76	77	72	64	54	53	62	300.1	446.7	67	58
Kansas City, Mo	P.	39	33	46	53	56	68	67	65	70	73	77	65	65	58	42	39	263.9	443.8	59	57
Key West, Fla	T.	......	75	79	84	89	91	92	94	87	84	89	85	84	68	69	......	348.5	414.6	84	64
Little Rock, Ark	T.	52	54	60	71	83	88	90	91	87	91	91	91	89	73	58	38	346.3	434.2	80	56
Los Angeles, Cal	P.	0	4	9	10	18	33	48	65	72	75	79	83	81	71	54	25	216.1	432.6	50	45
Louisville, Ky	T.	69	62	68	70	73	73	79	82	82	76	72	70	62	57	57	71	310.8	441.7	70	48
Minneapolis, Minn	T.	30	45	55	56	56	61	56	57	56	68	66	67	55	43	36	30	249.0	460.7	54	......
Nashville, Tenn	T.	72	62	61	65	71	73	75	79	80	77	74	66	64	64	60	57	302.6	436.7	69	64
New Orleans, La	T.	60	59	58	60	69	72	70	74	75	68	67	63	49	42	44	......	264.6	423.7	62	63
New York, N. Y	T.	41	38	54	63	71	75	76	84	89	83	83	79	72	62	34	36	304.9	449.1	68	48
Northfield, Vt	P.	28	31	39	42	52	50	51	50	51	46	46	49	49	42	20	10	195.9	457.9	43	32
Omaha, Nebr	P.	55	65	69	70	77	80	78	78	77	76	79	74	63	59	45	34	314.1	449.1	70	60
Philadelphia, Pa	T.	66	62	63	64	69	73	79	83	85	87	84	73	65	59	56	62	318.8	446.7	71	44
Phœnix, Ariz	P.	100	94	94	95	99	99	98	97	98	96	88	85	85	84	86	80	399.3	430.7	93	82
Pittsburg, Pa	T.	28	26	24	30	40	56	62	68	71	65	66	60	44	30	29	28	212.3	449.1	47	45
Portland, Me	T.	0	9	22	36	43	49	58	63	65	65	66	56	42	42	20	5	197.8	457.9	43	23
Portland, Oreg	T.	49	46	49	53	56	68	75	77	73	72	72	68	56	49	49	54	283.0	464.1	61	58
Portland, Oreg	P.	49	46	55	57	58	65	70	63	67	68	69	69	64	64	56	54	285.2	464.1	61	58
Raleigh, N. C	T.	33	36	37	53	75	84	91	93	86	87	81	77	59	52	45	43	296.6	436.7	68	51
Rochester, N. Y	T.	37	32	31	33	43	47	46	51	46	54	51	49	48	40	35	31	195.0	454.9	43	41
St. Louis, Mo	T.	49	60	69	74	78	87	88	91	81	77	80	76	79	71	52	53	334.7	443.8	75	60
St. Paul, Minn †	P.	41	41	52	54	51	55	41	29	31	44	51	62	61	58	38	43	149.4	316.1	47	35
Salt Lake City, Utah	P.	71	75	79	75	84	84	85	78	66	69	71	69	68	67	53	50	326.9	449.1	73	36
San Diego, Cal	P.	13	16	14	16	28	45	61	67	68	69	67	65	58	57	54	50	210.4	430.7	49	49
San Francisco, Cal	T.	22	36	45	52	56	81	96	98	99	99	100	91	78	59	35	36	319.9	441.7	72	59
Santa Fe, N. Mex	P.	36	49	72	79	79	85	77	70	68	55	51	45	49	38	21	7	260.8	436.7	60	52
Savannah, Ga	P.	75	72	77	85	84	88	90	85	87	80	82	88	73	50	32	......	330.3	428.4	77	68
Seattle, Wash	T.	44	45	54	59	59	65	84	95	89	89	90	87	71	55	43	40	321.4	471.3	68	51
Spokane, Wash	P.	38	40	53	67	76	84	84	86	93	88	86	76	74	59	47	41	328.8	471.3	70	59
Tampa, Fla	T.	......	83	84	82	82	85	82	79	82	82	80	73	72	74	75	......	333.2	419.8	79	77
Vicksburg, Miss	T.	75	62	72	83	95	99	99	99	96	94	93	89	85	79	65	......	371.3	428.4	87	74
Washington, D. C	P.	46	45	44	59	67	70	74	71	66	73	64	69	62	42	36	42	265.6	443.8	50	55
Wilmington, N. C	T.	14	11	40	69	81	90	97	97	98	95	89	81	72	52	21	25	307.8	432.6	71	61

* All values are for 28 days; the total possible and personal estimate for 31 days are 454.9 and 38 respectively.
† All values are for 21 days; the total possible and personal estimate for 31 days are 460.7 and 48 respectively.

TABLE XI.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded* 0.25 *in any 5 minutes, or* 0.75 *in 1 hour during May, 1897, at all stations furnished with self-registering gauges.*

Station.	Date.	Total duration. From—	Total duration. To—	Total am't of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	Depths of preciptation (in inches) during periods of time as indicated. 5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Atlanta, Ga.	14			0.20														0.12			
Atlantic City, N. J.	1-2			0.66														0.28			
Baltimore, Md.	21	1.43 p.m.	2.35 p.m.	0.72	1.49 p.m	2.00 p.m.	0.01	0.57	0.67	0.70	0.71										
Binghamton, N. Y	23-24			0.69														0.35			
Bismarck, N. Dak.	17			0.60														0.50			
Boston, Mass.	25			0.72														0.47			
Buffalo, N. Y.	12			0.45														0.37			
Chicago, Ill.	22-23			0.48														0.15			
Cincinnati, Ohio	23-24			0.42														0.33			
Cleveland, Ohio	9-10			0.75														0.32			
Denver, Colo	24	3.48 p.m.	5.10 p.m.	0.45	4.45 p.m.	4.55 p.m.	0.04	0.25	0.39	0.40											
Des Moines, Iowa	8-9			1.11														0.62			
Detroit, Mich.	9			0.49														0.45			
Dodge City, Kans.	27			0.39														0.33			
Duluth, Minn.	22			0.49														0.22			
Eastport, Me.	25-26			1.85														0.70			
Erie, Pa	20-21			0.65														0.22			
Galveston, Tex.	11			0.79														0.28			
Harrisburg, Pa.	14			0.52														0.40			
Hatteras, N. C.	1	1.12 p.m.	10.15 p.m.	0.98	2.18 p.m.	2.33 p.m.	0.05	0.30	0.40	0.50											
Indianapolis, Ind.	15	12.20 p.m.	2.20 p.m.	1.06	12.52 p.m.	1.43 p.m.	0.15	0.10	0.18	0.20	0.20	0.20	0.25	0.39	0.51	0.66	0.78				
Jacksonville, Fla.	12	7.15 p.m.	10.20 p.m.	0.82	9.27 p.m.	9.45 p.m.	0.27	0.06	0.13	0.39	0.50										
Jupiter, Fla	30-31	5.00 a.m.	3.00 a.m.	8.76	†	8.50 a.m.		1.34	1.42	1.50	1.55	1.56	1.60	1.67	1.74	1.82	1.87				
Do					8.50 a.m.	9.40 a.m.		1.92	1.99	2.06	2.14	2.19	2.22	2.25	2.29	2.34	2.39				
Do					9.40 a.m.	11.30 a.m.		2.43	2.46	2.50	2.53	2.57	2.60	2.62	2.64	2.69	2.73				
Do					10.30 a.m.	11.20 a.m.		2.80	2.89	2.97	3.05	3.09	3.16	3.24	3.29	3.35	3.40				
Do					11.20 a.m.	12.10 p.m.		3.44	3.49	3.55	3.62	3.68	3.76	3.92	4.09	4.18	4.34				
Do					12.10 p.m.	1.10 p.m.		4.58	4.76	4.93	5.14	5.43	5.68	5.89	6.07	6.22	6.28	6.45			
Kansas City, Mo	27-28			0.39														0.35			
Key West, Fla.	29-30	5.26 p.m.	12.10 a.m.	2.05	9.20 p.m.	9.35 p.m.	1.07	0.08	0.15	0.17	0.19	0.20	0.23	0.35	0.55	0.70	0.73	0.77	0.87		
Lincoln, Nebr.	19-20			0.82														0.14			
Little Rock, Ark.	28			0.52														0.38			
Louisville, Ky	11-12			0.71														0.46			
Memphis, Tenn.	13	11.22 p.m.	11.42 p.m.	0.55	11.22 p.m.	11.42 p.m.	0.00	0.30	0.41	0.48	0.55										
Milwaukee, Wis.	26			0.21														0.15			
Montgomery, Ala.	14			0.39														0.38			
Nantucket, Mass.	14			0.49														0.20			
Nashville, Tenn.	10			0.53														0.50			
New Orleans, La.	12			0.16							0.16										
New York, N. Y.	24-25	8.40 p.m.	1.10 a.m.	0.80	9.54 p.m.	10.34 p.m.	T.	0.20	0.36	0.46	0.49	0.55	0.61	0.65	0.67						
Norfolk, Va.	24	4.43 p.m.	6.35 p.m.	0.74	5.20 p.m.	5.45 p.m.	0.10	0.09	0.22	0.40	0.55	0.60									
Omaha, Nebr.	11	4.58 p.m.	7.55 p.m.	0.50	5.12 p.m.	5.22 p.m.	T.	0.25	0.41	0.43	0.45										
Philadelphia, Pa.	21	2.32 p.m.	4.50 p.m.	0.50	2.38 p.m.	2.53 p.m.	T.	0.30	0.37	0.41	0.43	0.45									
Pittsburg, Pa	1-2			1.05														0.34			
Portland, Me.	2-3			1.68														0.33			
Portland, Oreg.	16-17			0.35														0.07			
Raleigh, N. C.	30-31			0.49														0.22			
Rochester, N. Y.	14			0.19														0.17			
St. Louis, Mo.	9			0.78														0.51			
St. Paul, Minn.	18-19			1.05														0.29			
Salt Lake City, Utah.	24			0.48										0.25							
San Diego, Cal.	23			0.04																	
San Francisco, Cal.	16-17			0.61														0.19			
Savannah, Ga	12			0.38														0.35			
Tampa, Fla.	11			0.12														0.06			
Vicksburg, Miss.	10			0.18														0.15			
Washington, D. C	12-13	11.30 p.m.	9.40 a.m.	1.75	12.35 a.m.	1.30 a.m.	0.15	0.13	0.15	0.30	0.39	0.41	0.45	0.48	0.56	0.66	0.72	0.81	0.89	0.98	1.07
Washington, D. C	24	5.36 p.m.	8.24 p.m.	0.98	5.36 p.m.	6.21 p.m.	T.	0.05	0.30	0.33	0.40	0.42	0.46	0.55	0.69	0.73	0.75	0.79	0.85		
Wilmington, N. C	15	7.15 p.m.	9.10 p.m.	0.48	7.33 p.m.	7.45 p.m.	0.02	0.18	0.33	0.41	0.42										

*Self register out of order. †The storm began about 5 a. m. of the 30th, but the self register failed to record until 8 a. m., at which time 1.25 inches had fallen. Heavy rain continued from 8 a. m. to 1 10 p. m., during which time 5.20 inches were recorded, making a total fall of 6.45 inches in 8 hours and 10 minutes. Light rain continued after 1.10 p. m., until 10.30 p. m., when heavy rain again began, 0.90 falling in about 30 minutes, after which rain continued light until about 3 a. m. of the 31st. The accumulated amounts for each 5 minutes are given from 8 a. m. to 1.10 p. m., the first amount, 1.34, being the total fall from the beginning of the storm to 8.05 a. m.

TABLE XII.—*Excessive precipitation, by stations, for May, 1897.*

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Alabama.	*Inches.*	*Inches.*		*Ins.*	*h.m.*	
Birmingham		2.88	13			
Decatur		3.30	12-13			
Scottsboro		2.97	10			
Arkansas.						
Arkansas City		3.25	9-10	2.45	1 30	10
Fulton				2.43	1 00	11
Newport				1.50	1 00	12
Colorado.						
Arkins		2.68	20			
Boxelder		2.60	19-20			
Greeley				1.18	0 30	21
Wray		3.00	20			
District of Columbia.						
Washington		2.81	12-13			
West Washington		3.17	12-13			
Florida.						
Boca Raton	11.00	9.85	30-31			
Earnestville				2.12	0 30	15
Huntington				1.26	1 00	14
Jupiter	10.73	8.76	30-31	2.84	1 29	30
Kissimmee		2.55	12			
Lemon City		4.00	30			
Plant City				1.88	1 00	12
Georgia.						
Washington				2.25	2 00	1
Waycross		2.98	13-14	2.30	0 55	13
Illinois.						
Laharpe				1.75	1 30	27
Indian Territory.						
Healdton		5.58	9-10			
Kemp		3.69	10			
Tahlequah		4.35	28-29			
Iowa.						
Denison				1.00	1 00	19
Guthrie Center				1.70	1 30	19
Kansas.						
Delphos				1.12	1 00	26
Downs				1.43	0 40	10
Gove		2.66	8			
Meade				2.10	0 45	21
Louisiana.						
Alexandria		3.51	11			
Amite		3.15	12-13			
Covington		2.55	13			
Franklin*				1.28	0 40	30
Hammond		2.85	12			
Lafayette				1.19	0 40	29
Mansfield				1.54	1 30	24
Thibodeaux				2.22	0 30	14
Maine.						
Bar Harbor		2.50	2-3			
Maryland.						
Bachmans Valley		2.74	13-14			
Boettcherville		3.00	1-2			
Collegepark		2.60	13			
Taneytown		3.35	12-13			
Mississippi.						
Windham		2.88	11			
Woodville		2.84	8			
Missouri.						
Elmira				1.36	1 00	22
Irena				1.07	1 00	22
Lamonte		3.38	26	3.38	3 00	26
Mount Vernon		3.00	9			
Platte River		3.82	25-26	3.00	3 00	25-26
Sarcoxie		2.74	9			
Sedalia		3.00	26			
Nebraska.						
Alliance				1.23	1 10	31
Arapaho		2.50	21			
Auburn		2.87	25-26			
Rulo				1.70	1 00	25
Tecumseh		4.40	26			
New Hampshire.						
Hanover		2.77	12-13			
New Jersey.						
Belvidere		2.62	13			
Charlotteburg		3.23	12-13			
Chester		4.00	1-2			
Dover		3.98	1-2			
Englewood		2.98	10	2.98	2 15	10
Hanover		2.58	13			

TABLE XII.—*Excessive precipitation*—Continued.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
New Jersey—Continued.	*Inches.*	*Inches.*		*Ins.*	*h.m.*	
Junction		4.25	1-2			
Rivervale		3.20	12-13			
Roseland		2.75	13			
Sergeantsville		2.59	1-2			
Somerville		2.52	1-2			
New Mexico.						
Galisteo		3.00	19			
Gallinas Spring				1.15	0 30	27
New York.						
Bedford		4.72	12-13	1.75	0 50	12
Catskill		3.30	13			
North Carolina.						
Beaufort		4.07	1			
Flatrock		2.88	1			
Lumberton		2.54	2			
Pantego		3.14	1			
Settle				1.12	0 45	11
North Dakota.						
Forth Berthold				1.03	1 00	25
Oklahoma.						
Arapaho		3.48	5-6			
Beaver				1.18	0 30	27
Prudence				1.30	1 00	13
Pennsylvania.						
Blooming Grove		3.32	1-2			
Coopersburg		3.58	12-13			
Duncannon				1.02	1 00	14
East Bloomsburg				1.10	0 45	14
Frederick		2.63	13			
Hamburg		2.50	1-2			
Huntingdon		3.00	1-2			
Ottsville		2.95	13			
Point Pleasant		3.08	1-2			
Do		2.82	13			
Pottstown		2.50	1-2			
Seisholtzville		3.08	1-2			
Smiths Corners	10.05	3.06	1-2			
Do		2.73	13			
Swiftwater		3.00	2			
South Carolina.						
Georgetown		2.75	13			
South Dakota.						
Armour		2.55	18	0.95	0 25	18
Wentworth		3.09	26-27			
Tennessee.						
Clinton		2.60	12-13			
Decatur		3.91	12-13			
Erasmus		3.07	12-13			
Knoxville		2.97	12-13			
Texas.						
Beeville		2.75	11	2.75	2 25	11
Brownwood		3.95	5-6			
Columbia				1.17	1 00	14
Dublin		2.65	6-7			
Forestburg		4.58	9-10			
Gail		4.50	28	4.50	2 00	28
Golindo				1.80	1 30	11
Hearne		2.75	16			
Henrietta				1.35	1 00	22
Houston		2.55	24-25			
Junction City				1.24	1 00	24
Longview		2.55	28-29	1.00	1 00	28
Lufkin		2.51	30			
Rheinland				1.12	1 00	26
Rocksprings		3.10	12-13	1.34	1 15	11
Do				2.00	1 15	12
Do				1.00	1 00	13
Sanderson				1.00	1 00	11
San Marcos				1.17	1 00	5
Stafford		2.50	24	1.00	1 00	6
Tivoli				1.40	0 30	11
Waxahachie		3.10	10			
Virginia.						
Alexandria		3.22	12-13			
Barboursville		2.94	12-13	1.33	1 20	24
Guinea		3.00	23			
Staunton		3.53	1			
Wisconsin						
Citypoint		4.40	19	4.40	1 30	19

Chart I. Tracks of Centers of High Areas. May, 1897.

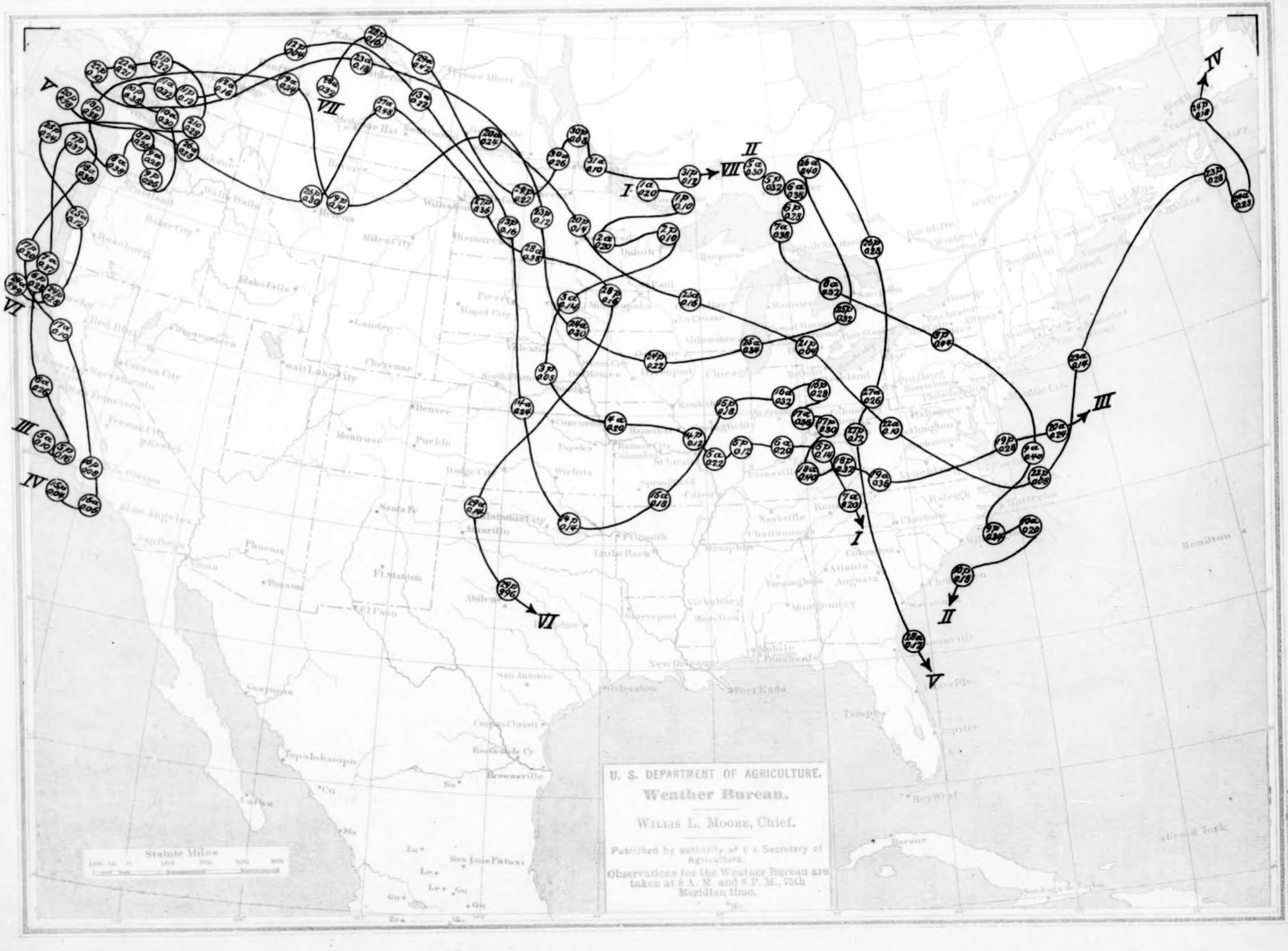

Chart II. Tracks of Centers of Low Areas. May, 1897.

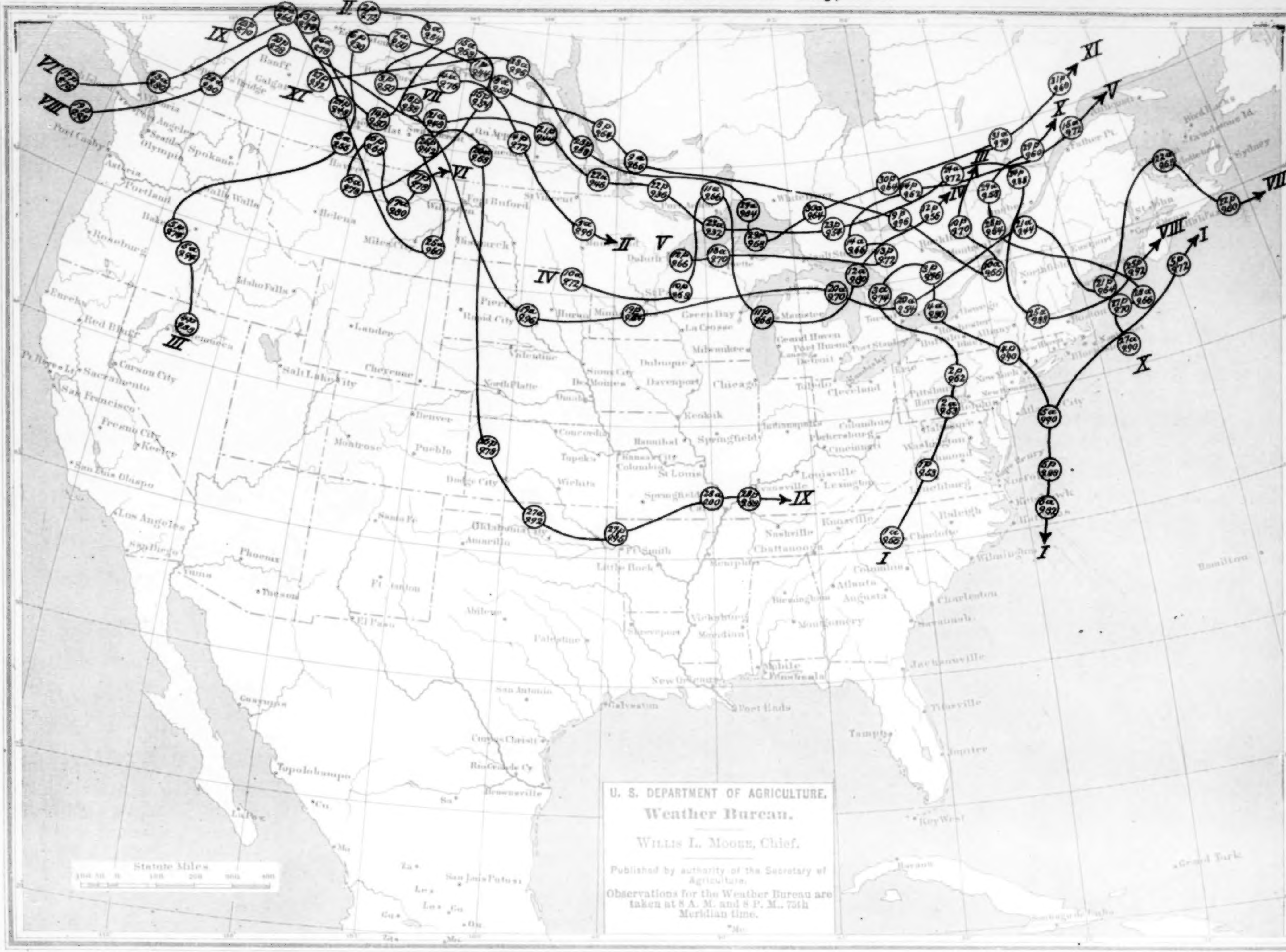

Chart III. Total Precipitation. May, 1897.

Chart III. Total Precipitation. May, 1897.

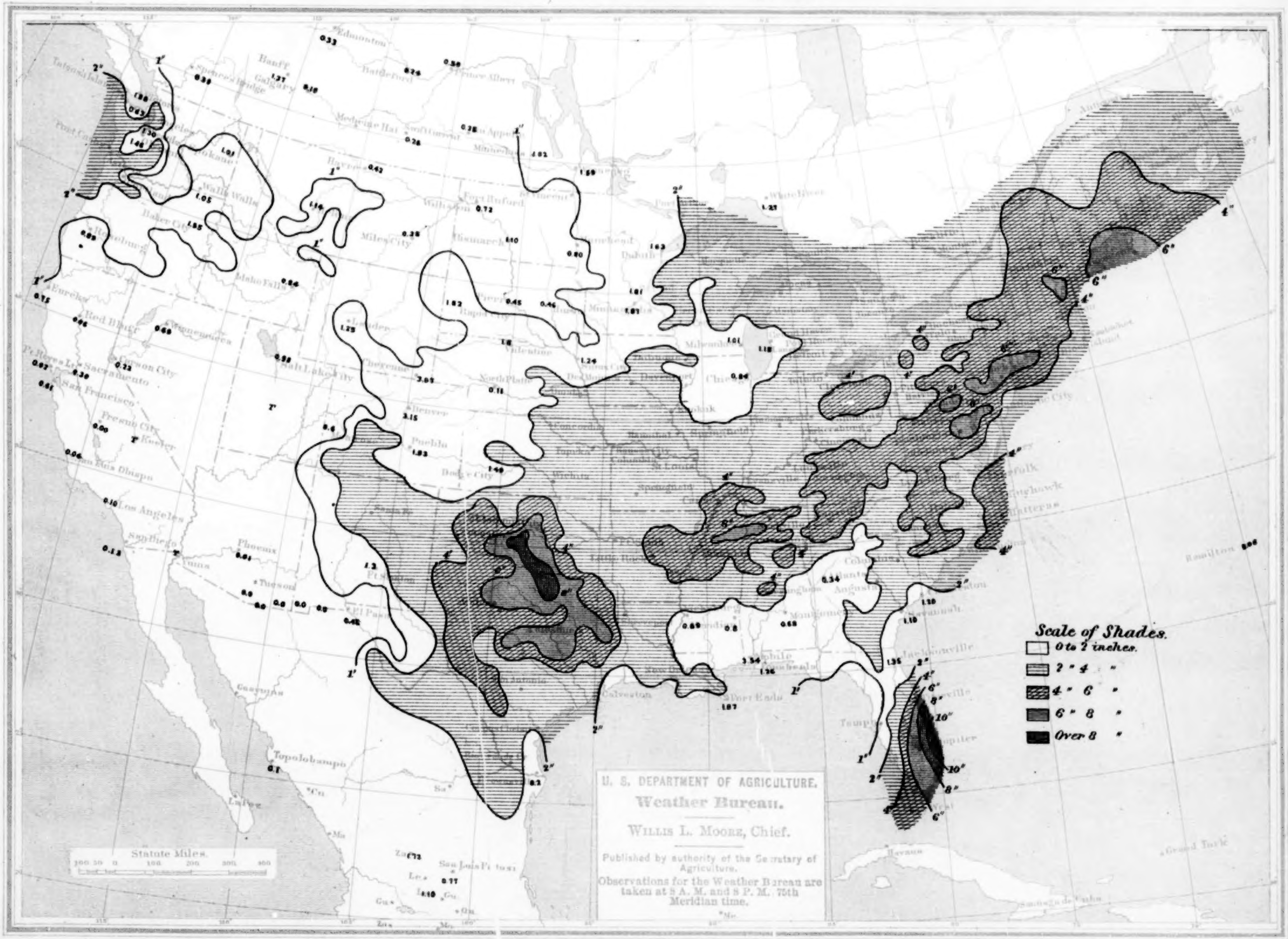

Chart IV. Isobars, Isotherms, and Resultant Winds. May, 1897.

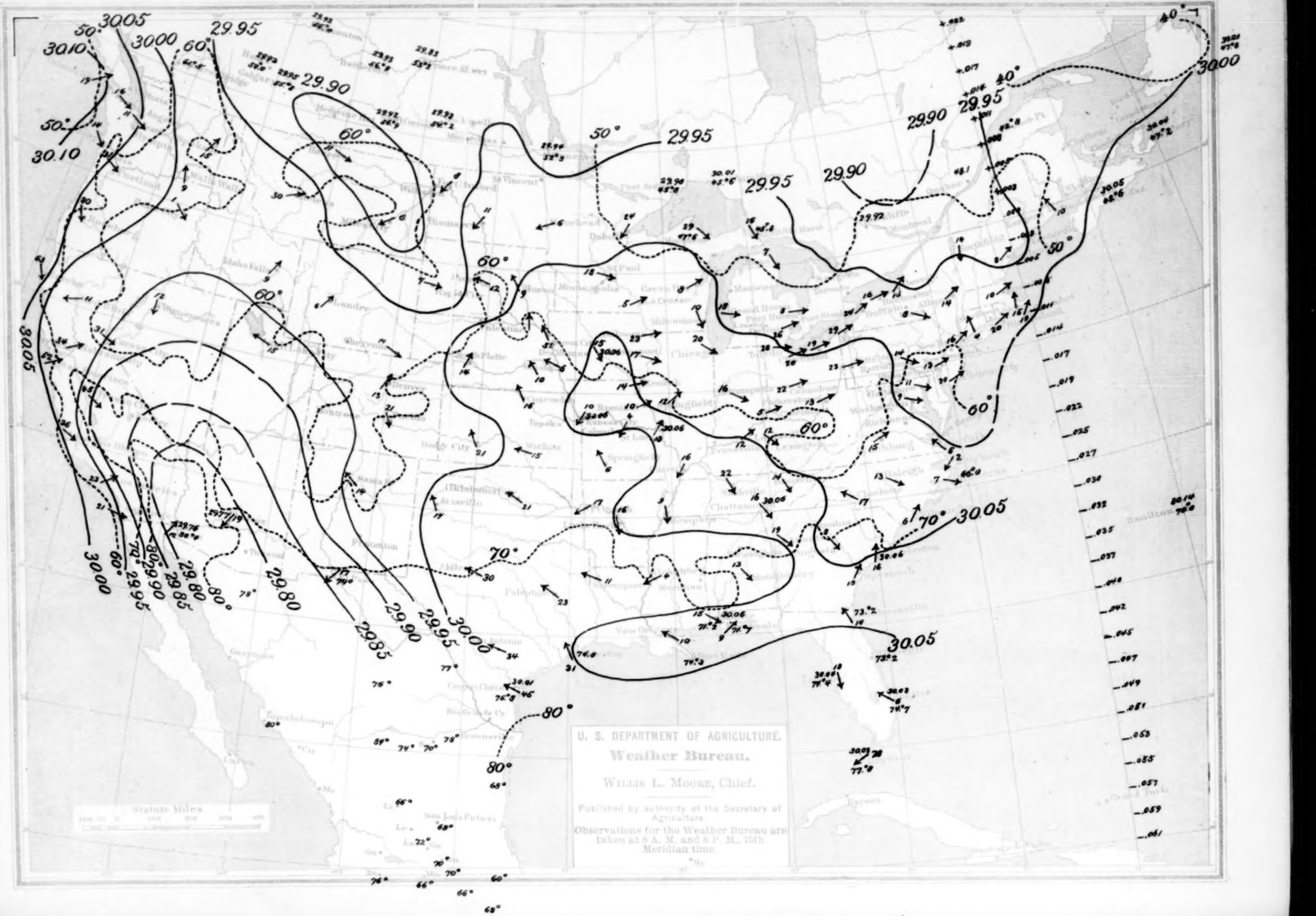

Chart V. Hydrographs for Seven Principal Rivers of the United States.